

The Milbank Memorial Fund
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THE CHANGING CONCEPT OF PUBLIC HEALTH¹

by EDGAR SYDENSTRICKER

VARIOUS historians have pointed out that the modern public health movement has undergone marked and fundamental changes. Some of these changes were precipitated by epoch-making scientific discoveries; others came through the evolution of social objectives and methods. The early days of the movement were dominated by the "filth" theory, that public health could be achieved by community cleanliness and sanitation. Then came the period initiated by the epoch-making work of Pasteur and Koch and their followers. This was an era of bacteriology in which the dominant idea was that public health could be achieved by medical measures. The campaign against tuberculosis gradually ushered in the third period during which it was realized that a disease such as tuberculosis could not be conquered by community sanitation and medical measures alone, because its prevalence was so bound up with many other environmental factors. Since then the concept of the scope of public health necessarily has broadened with attacks on such problems as infant mortality, dietary deficiency diseases, industrial hygiene, and mental hygiene.

Although considerable specialization (which so often narrows the view) has taken place, a further broadening of the concept of public health is evident. "Public health is not hygiene or preventive medicine," as the late and beloved Dr. Linsly R. Williams once said.² "It is a concept of the condition of health of the community. Efforts to conserve the public health include both those which affect the health of the community as a whole, and those which seek to prevent any individual or group of persons affect-

¹ A portion of this paper was contained in an address read at the Institute of Public Affairs, University of Virginia, July 5, 1935.

² Williams, Linsly R.: *The Rôle of the Practitioner in Modern Public Health Work. PREVENTIVE MEDICINE AND PUBLIC HEALTH.* New York, Thomas Nelson & Sons.

ing adversely the health of others." Recently, in the consideration of ways and means whereby economic security of the great mass of the population may be enhanced, the current concept of the term "public health" has come in for renewed scrutiny since so much economic insecurity arises out of ill health. Public health is being looked upon more as a major social objective, not as merely sewage disposal, or the prevention of infectious diseases, or popular instruction in hygiene. This is the natural result of a keener appraisal of all of the things yet to be done and a clearer realization of the fact that many forces, although apparently directed toward widely different objectives, have a common basic aim.

I

It is worth a few minutes' time to take stock of some of the things that need to be done and that can be done in the further promotion of public health. Readers of Dr. Bolduan's brief but illuminating article in the last issue of the *Quarterly* will recall his impressive exhibit on the conquest of pestilence in New York City. But, as he comments, "while the course of the City's death rate during the last eighty years as here recorded is most gratifying, there is danger that it may make us too complacent, and inclined to believe that there is little left for health officers to do." Moreover, the task should be measured not merely in terms of the mortality rate. It has been pointed out⁸ that among an average million persons in the United States, there will occur annually between 800,000 and 900,000 cases of illness. It may be predicted for this average million persons that, though 470,000 will not be sick during a normal year, 460,000 will be sick once or twice, and 70,000 will suffer three or more illnesses. Of those who become ill, one-fourth will be disabled for periods varying from one week to the entire year. The gigantic annual money loss in wages

⁸ Report to the President by the Committee on Economic Security, January 15, 1935, pp. 38-39.

caused by sickness in families with small and modest incomes in the United States is estimated to be not less than nine hundred million dollars, and the still larger expenses of medical care probably are not less than one and a half billion dollars. These are only the direct costs. The much larger costs of depreciation in capital values of human life are incalculable. Even the direct costs could be borne if they were distributed equally, but they are not.

Science has not yet given us the means with which to prevent all of this sickness or to enable everyone to live healthfully until the end of the natural span is reached. But, as I have tried to emphasize in an earlier paper,⁴ the plain fact must be faced that notwithstanding great advances in medicine and public health protection, the American people are not so healthy as they have a right to be. Millions of them are suffering from diseases and over a hundred thousand die annually from causes that are preventable through the use of existing scientific knowledge and the application of common social sense.

Ample evidence exists to support this sweeping statement. The ravages of typhoid fever, diphtheria, and smallpox have been enormously lessened; they ought to be and can be eradicated. The infant death rate has been cut in half in the last quarter century, but it can again be cut in half. Mortality from tuberculosis has been reduced by 60 per cent since 1900, and could be halved again. Two-thirds of the annual thirteen thousand maternal deaths are unnecessary. At least three-fourths of a million cases of syphilis are clinically recognized annually; but more than half of these do not obtain treatment at that stage of the disease when the possibility of cure is greatest. We have been rather vociferous in recent years over the health and welfare of children; yet it is estimated that 300,000 are crippled, a million

⁴Health in the New Deal. *Annals of the American Academy of Political and Social Science*, November, 1934.

or more are tuberculous, and nearly half a million have heart damages or defects.

The mortality of adults of middle or older ages has not appreciably diminished. The expectation of length of life at forty is about the same now as it was in 1850, 1890, or 1900. The mortality of adults who should be in their physical prime—20-44 years of age—is almost as great as that of the younger group, which includes babies and children. The mortality of persons who ought to be in full mental vigor and still capable of many kinds of physical work is over three times that of the younger adults. In the young adult ages, 20-34 years, tuberculosis still tops the list as a disease; accidents and homicides snuff out about one life in a thousand annually; organic heart disease appears in even this young age period as the third most important cause of death. All careful studies of illness and physical impairments corroborate these ghastly records; in fact, they reveal even more impressively than mortality statistics the extent to which the vitality of the population is damaged in the most efficient period of life. This disconcerting evidence of impaired efficiency among our adult population takes on a graver significance in view of the changing age of our adult population. We can no longer squander the vitality of our grown men and women. The task of health conservation in the future must be broadened to include adults as well as children.

II

Such a situation need not exist if public health be made, as political leaders from Disraeli to Roosevelt have pronounced, the first concern of the State. Public health never has been the *first* concern of the State except in catastrophic situations. We are somewhat accustomed to accuse the politicians of lack of understanding, the medical profession of failure to cooperate, employers of unenlightened selfishness, trade unions of insistence upon measures not directly related but even inimical to health,

and so on. If there is any blame to be attached to any one group, the professional sanitarian should come in for his share since the public looks to him to define the scope of public health. The trouble lies deeper. The prevailing concept of public health responsibilities has been and is too narrow. It is restricted to a few activities such as community sanitation, water supplies and food inspection, control of infectious diseases, education in hygiene, the medical care of the tuberculous and mentally diseased, and the medical care of the indigent. A newer concept which many sanitarians are coming to accept is much broader and far more sound. It may be stated in terms somewhat as follows:

Society has a basic responsibility for assuring, to all of its members, healthful conditions of housing and living, a reasonable degree of economic security, proper facilities for curative and preventive medicine and adequate medical care—in fact the control, so far as means are known to science, of all of the environmental factors that affect physical and mental well-being.

Such a concept in no way postulates any particular form of government. There is no reason why society cannot discharge this responsibility under any form of government through which it can express its will. Nor does this concept postulate "state medicine," "regimentation of physicians," or Sovietized control of those who render health services. It is the expression of a social objective. The public health of the future demands some sensible coordination of public health functions with private medical practice, some solution of the economic problems that are involved in obtaining preventive and curative medicine, some set of procedures by which the physician, sanitarian, and social worker can do their best work in preventing disease, in the care of the sick, and in the rehabilitation of the unfortunate. To what avail, for example, is the instruction of an expectant mother by a health department nurse if she cannot pay for the services of a com-

petent obstetrician and afford the special services needed if her case is a difficult one? I do not propose that there should be a uniform national plan or set of procedures, because, in a country so large and diversified as ours, methods and procedures necessarily must vary according to states and communities. The inter-relationship of the essential environmental conditions involved demand, however, a concept of society's responsibility for the health of its members that rises above the petty jealousies and bickerings that too frequently impede honest attempts to find satisfactory methods and procedures. It will not always be so. Some day the basic criterion of any condition or any practice or any proposal will be the effect it may have upon the public health.

III

In the light of these considerations, some of the more direct modes of attack on the general problem of public health may be referred to briefly. Science and experience have taught us some methods by which specific approaches can be made. Other methods, which may or may not be practical, are being proposed and need to be considered dispassionately and experimented with.

1. Greater economic security for families of modest and low incomes, whether attained by unemployment compensation, old age annuities, wage increases, or other methods, is, in itself, a preventive measure against ill health. This conclusion follows inevitably from the long-known association of poverty and disease and the vicious circle which this association contains. The fact that the American people have not suffered to a greater extent from ill health than might have been expected during a severe economic depression is due, I believe, in large measure to the sharing of savings by related persons, to private philanthropy, and later, to the provision of relief and employment by the State and Federal Governments on an extraordinary scale.

2. The prevention of ill health through the extension and de-

velopment of direct public health measures of proved value is essential. In the past, expenditures for this purpose, except in comparatively few areas, have been niggardly, and the policy of placing the responsibility for preventive measures upon communities and states has failed ignominiously. The average expenditure out of tax funds for public health purposes in American cities in 1929 was only \$1.00 per capita, less than half the sum which competent experts have estimated is necessary. Only about one-fifth of the rural population of the United States has the benefits of organized health machinery and in nearly all the 500-odd counties having some sort of health services, the budget and personnel are regarded as far below any reasonable standard of efficiency. Up until the recent passage by Congress of the Economic Security Act, efforts to get the Federal Government to do for public health what it has done for education, agriculture, and roads, had been unsuccessful. It is exceedingly gratifying that for the first time in the history of the United States, the President has recommended to the Congress a very considerable increase in appropriations for public health purposes, and that the authorization of these specific measures was not opposed in the Congress.

3. The precise relationship of housing to health is not fully known but there is no question that certain types of housing are conducive to the spread of infectious diseases and tend to break down the resistance of inmates to other diseases. Slum clearance in our cities and better housing for persons of low incomes wherever they may live are clearly preventive measures which are in the category of public health functions.

4. The application of the newer knowledge of nutrition through education and through better distribution of the so-called supplementary foods, constitutes another preventive attack upon the general problem of ill health. In his presidential address before the American Medical Association last June, Dr. James S.

McLester gave an illuminating exposition of the possibilities in this direction. He pointed out that "it is difficult to estimate how many persons in this country are so poor that they are unable to purchase the food necessary to keep them in health," but he ventured to say that, "something like twenty million American people are living near or below the threshold of nutritive safety."

5. Physical training, recreation, and education in hygiene and community health are matters about which we "confer" at length but do very little except in a few localities. We lag far behind some other countries in providing adequate facilities for training and recreation and in properly correlating health education with other subjects in our curricula. One may say that our public school system is so vast and so routinized that it cannot easily be altered; yet in education lies a powerful means toward public health.

6. The new interest in population questions in this country gives some promise that limitation of size of family, redistribution of population, and other methods of population "control" will be considered more scientifically than before. These possible measures obviously have real significance from the viewpoint of health conservation.

7. Social work has so long been coordinated with health services that it is perhaps unnecessary to do more than mention it as a definite public health measure. The policy of relief on a gigantic scale during the past few years has given greater emphasis to the need for an even closer and more efficient coordination of social work and health services, including medical care.

8. Medical care is an essential health service, but the people do not get enough of it. It is not fully applied. It has been thoroughly established that under existing conditions, even in normal economic periods, thousands upon thousands of families are unable to purchase medical care when sickness occurs. Less than 10 per cent of the population have had even a partial physical exam-

ination; less than 5 per cent are immunized against any disease. These conditions persist in spite of the fact that there are enough doctors, nurses, and others who render or assist in rendering medical services—about a million persons all told—to take care of all sicknesses and do nearly all of the preventive work for individual patients that we now know how to do.

The subject of medical care recently has come to the fore in discussions of public health and the economic security of the patient and the physician. Opinion is divided as to the best methods of obtaining a better distribution of medical care. But there seems to be no dissent from the proposition that care of the indigent sick and crippled and otherwise unemployable persons should be a responsibility of the government; that the diagnosis and treatment of persons affected with certain types of disease (such as tuberculosis, cancer, syphilis, and gonorrhea) should be a tax-supported function; and that federal, state, and local governments should join in providing general hospital facilities in areas unable to support them locally. But beyond this, wide divergence exists in the views of those who are studying other ways of distributing medical care. There are still a few who are satisfied with the *status quo*. Others take the view that before any state-wide and national plan is considered, local experimentation with various ways of paying for medical care should be carried on. Some of these experiments have been in operation for some time and new ones are being started. This is an encouraging sign of a growing consciousness of the situation on the part of the medical profession and of the public. Other proposals involve programs on a larger scale. Only recently the distinguished commissioner of health of New York State, Dr. Thomas Parran, Jr., proposed that all persons participating in the old age annuity plan and unemployment compensation under the Economic Security Act and all others having annual incomes of less than \$2,500 should be given "public care for costly illness." He sug-

gested that the types of medical care which might be provided at public expense, in whole or in part, for the lower-income groups of the population, might be facilities for accurate diagnosis, obstetrical care, hospital care, home nursing, and the treatment of chronic diseases. Then there are the much debated proposals of various kinds for health insurance among individuals who, though not dependent, lack sufficient income to budget against the costs of needed medical care, especially the more costly medical services. These proposals are of two general types. One is insurance against the loss of wages resulting from illness, and the other is insurance against the costs of medical care. Many proposals for variations within each of these two general types are being considered. The experience of European nations as well as of Great Britain and Japan with health insurance of some form or other has, of course, suggested to many the possibility of health insurance in the United States, provided its administration can be so safeguarded as to preserve the advantages of the private practice of medicine and to prevent the interference of politicians.

IV

All of these should be considered as possible strategic approaches in the attack upon ill health and its consequences. No one of them is sufficient by itself. There is no single panacea, for the obvious reason that all of man's environment is involved. Different modes of attack involve different interests, groups, and individuals. Conditions, social and physical, which affect health vary according to locality and climate. Whether in the future some coordination of all these efforts in a comprehensive plan under central control in the community or the state or the country will appear advisable is another question. But the concept of public health as a major social objective should be broadened to a degree where the importance of each effort, each measure, each method gradually may be seen in its true perspective.

THE NATURAL INCREASE OF THE RURAL NON-FARM POPULATION

by T. J. WOOFER, JR.¹

THE ill-defined element between the open country and the city which is classed as "rural non-farm" by the census includes a segment of the population which has not been sufficiently analyzed with respect to its natural increase. The analysis has lagged because the basic data have been lacking. Before 1930 it was difficult to measure the difference between rural and urban natural increase. Births and deaths were allocated to "urban" or "rural" classifications according to whether they occurred in incorporated cities of 10,000 and over or in smaller cities and open country. Population was classed as urban or rural according to whether it was located in towns of 2,500 and over or in smaller villages and open country. Even the latter dividing point of 2,500 includes in the "rural" group too numerous and too heterogeneous a segment of the population to be of much use in precise measurements of natural increase.

With the split of census population data into rural farm and non-farm and the further segregation of metropolitan districts from the open country, a much clearer delineation of the elements in the rural non-farm population is possible. The recent publication of age-group data for villages and minor civil divisions makes it possible to center definitely on non-farm areas. No such progress has been made in the segregation of birth and death statistics into significant non-farm classifications. In fact the study of births and deaths in non-farm groups would require original tabulations of minor civil divisions and even of areas within minor civil divisions.

In 1930 nearly twenty-four million, or about a fifth of the total population, was classed as rural non-farm. The increase of this

¹ Institute for Research in Social Science, The University of North Carolina.

element in the previous ten years had been 18 per cent, a faster rate than the total increase.

The subdivision of the rural non-farm by areas, as far as it can be carried from the census data, is shown in Table I.

Table I. Rural non-farm population, 1930.

Type of Community	Number (in millions)	Per Cent
TOTAL	23.7	100
Detached village ¹	8.5	36
Metropolitan "rural" ²	5.4	23
Other ³	9.8	41

¹ Includes all incorporated villages (under 2,500) except those in metropolitan areas. Fifteenth Census, Vol. 1.

² Includes all non-urban metropolitan villages and unincorporated areas. Fifteenth Census, 1930, *Metropolitan Districts*.

³ Includes all other non-farm groups such as unincorporated suburbs of small cities, unincorporated industrial and mining areas, and dwellers in the open country. Total rural non-farm minus detached villages and metropolitan rural.

As will appear in the subsequent discussion, further subdivision would be most valuable—division of the villages into types of village, especially agricultural and industrial, division of the metropolitan into industrial and white-collar residential suburbs division of the "other" into suburbs of small cities—unincorporated industrial areas and scattered open country dwellers. Such analysis, however fruitful, will have to await more elaborate research into the field than was possible in preparation of this paper.

These groups with the exception of the agricultural villages were increasing their proportion in the composition of the national population up to the depression. Suburbanization increased by leaps and bounds, industrial villages and centers spread along expanding electric power lines, and there was a normal increase in open country dwellers obtaining a livelihood from other than agricultural pursuits. Since the depression, normal movements and the efforts of planners have been directed in several channels which will increase the relative importance of the element which is neither farm nor city. The planned movements referred to are the promotion of the decentralization of industry, of part-time farming, and of farm-industrial colonies. Even partial success of any of these will materially increase the proportion of the non-farm group.

In spite of the large and increasing importance of this group, we are without sufficient facts to answer fully such fundamental questions as: Does the rural non-farm fertility rate correspond more closely to the urban than to the rural farm? How rapidly is it declining? What are the factors incident to the decline? What is the relative incidence of these factors in the sub-groups of the rural non-farm elements?

In view of the gaps in the basic material, this article does not propose to present any exhaustive answers to these questions but will be confined to description of the general characteristics of rural non-farm increase with the hope that the clues discovered will point the way to more intensive study and the application of more refined methods.

Lack of birth and death statistics is, in a sense, compensated by the fact that sex and age distributions are available for minor civil divisions, making possible the calculation of the ratio of children under 5 per 1,000 women 15 to 44 years of age as a measure of natural increase.² It is recognized that this ratio has many defects. The principal ones arise from divergencies in age distribution within the 15 to 44 group and variations in the proportion of married women in populations disturbed by migration and the variations in the infant death rate. Some insight into the elements of the problem is, however, afforded by the comparison of the ratios of children to women.

The general comparison of rural non-farm with other elements is shown in Table 2.

It is apparent that the rural non-farm group is much closer in fertility to the rural farm than to the urban, and that the index of fertility is higher for the whites than for Negroes in all areas except the rural farm. The increase of the Negro ratio of children to women in the urban area from 1920 to 1930 is probably

² In order to calculate this ratio for villages or minor civil divisions it is necessary to estimate the women 15 to 44 from the total within this age category divided by two, and adjusted for the divergence of the sex ratio from 100.

more apparent than real, owing first, to the undercount of Negroes in 1920, which was greater in the urban and rural non-farm groups than in the open country, and greater in the young age groups than in the older,³ and second, to the fact that the 1920 Negro population was much disturbed by internal migration, and the consequent disproportionate piling up of middle-age groups in industrial towns. This was to some extent adjusted between 1920 and 1930. However, there is probably some real basis for a slower decline in Negro increase, since their rapid reduction in infant mortality more than offsets the reduction in the birth rate.

The ratio of children to women in the Southeast by color in 1930 and the change in the total from 1920 to 1930 is given in Table 3.

The differential changes from 1920 to 1930 in the state ratios are difficult to explain both because of insufficient basic data and because of the complexity of the problem.

When the state-to-state fluctuations in the white rate for 1930 are considered, some of the factors involved are evident. States with a high rate of white illiteracy in the rural non-farm group also tend to have a higher rate of natural increase. States with high ratios of children in the rural farm population also have high ratios in the rural non-farm, indicating that to a marked extent the mores of the farm group carry over into the non-farm.

³ *Vide*. The Census of 1920 enumerated 1,144,000 Negroes, under 5. In spite of deaths in this group and without appreciable migration, the Census of 1930 enumerates 1,252,000 as 10 to 14.

Table 2. Number of children under 5 years of age per 1,000 women 15-44 years of age by color in the urban, rural farm, and rural non-farm population of the United States, 1920 and 1930.¹

Type of Community	Native White	Negro
Urban 1920	313	248
1930	292	269
Rural farm 1920	596	604
1930	529	566
Rural non-farm 1920	496	433
1930	463	426

¹ Native white ratio is native white mothers divided into children native white of native parents plus children native white mixed parents minus children of mixed parentage with foreign mother. 1920 ratios based on Thompson's estimate of ratio of children to women.

STATE	RURAL NON-FARM					RURAL FARM 1930
	1930		Both Races			
	Native White	Negro	1920	1930	Decrease	
Alabama	553	426	525	505	20	610
Arkansas	504	324	507	459	48	574
Georgia	454	404	486	434	52	578
Kentucky	611	410	589	584	4	614
Louisiana	554	412	505	495	10	587
Mississippi	468	350	452	415	37	564
North Carolina	552	506	604	539	76	631
South Carolina	509	468	525	493	32	585
Tennessee	541	375	547	517	30	566
Virginia	544	524	599	539	60	573

Table 3. Children under 5 years of age per 1,000 women 15-44 years of age, rural non-farm population 1920 and 1930, and rural farm, 1930, Southeastern states.

On the whole, however, analysis by states is an unsatisfactory procedure. The unit is too large and the rural non-farm population of any one state is made up of too many and too complex elements to warrant comparison of one state with another even in so homogenous a section as the white South.

On the basis of the above conclusion, that the rural non-farm increase is closely related to the rural farm increase and is between the urban and rural rates, one would expect a steady upward progression of the ratio of children as the distance from the city increases. This was hinted by Kolb and Brunner in their analysis of rates of increase according to progressive distance from the city.⁴ They compared the rate in the city county with those of the first surrounding tier, the second surrounding tier, and the third and fourth surrounding tiers, showing a steady increase in child-woman ratios as the distance from the city increased (except in the fourth tier).

In Table 4 it appears that the rates rise with increasing spatial distance from the city. More detailed analysis of areas, however, indicates that the opposite is in some respects the case.

When the increases are calculated according to types of suburbs

⁴ See footnote to Table 4.

REGION	CITY COUNTY	TIERS OF COUNTIES			
		1st	2nd	3rd	4th
<i>Rural Farm</i>					
All regions	1,368	1,435	1,488	1,504	1,485
South	1,474	1,629	1,696	1,681	1,638
<i>Rural Non-Farm</i>					
All regions	1,139	1,148	1,167	1,213	1,121
South	1,169	1,269	1,310	1,369	1,215

¹ Adapted from: Brunner, E. deS. and Kolb, J. H.: *RURAL SOCIAL TRENDS*. New York, McGraw-Hill Book Co., Inc., 1933, p. 118.

Table 4. Children under 10 years of age per 1,000 women 20-44 years of age in rural farm and rural non-farm population, 1930.¹

and villages as in Table 5, it appears that some of the areas which are closest to the city in occupational distribution and physical distance are higher in natural increase than others. Industrial suburbs immediately adjacent to the city and industrial villages have much higher ratios of children to women than agricultural villages.

Such a surprising divergence from the expected calls for a careful review of the method to ascertain what factors are controlled and what uncontrolled. It will be noted that the per cent of Negroes is fairly uniform throughout and that the sample is pre-

Table 5. Children under 5 years of age per 1,000 women 15-44 years of age, and certain descriptive data for selected rural non-farm areas, Cotton States, 1930.¹

TYPE OF AREA	CHILDREN UNDER 5	WOMEN 15-44	CHILDREN UNDER 5 PER 1,000 WOMEN 15-44	PER CENT OF WOMEN 15-44 WHO WERE 25-34	MALES PER 100 FEMALES	PER CENT NEGRO
7 Agricultural villages	1,162	3,113	373	30	89	10
7 Textile villages	1,401	3,195	438	31	91	13
5 Industrial suburbs	3,916	7,520	521	33	102	12
5 Resident suburbs	2,280	7,139	320	37	94	18

¹ *Areas Sampled:* Villages—Agricultural: Alabama, Scottsboro; Arkansas, Nashville; Georgia, Jefferson, Cornelia; North Carolina, Carthage, Murphy; Tennessee, Crossville, Textile; Georgia, Hogansville; North Carolina, Randleman, Gibsonville, Leaksville, Rutherfordton; South Carolina, Liberty, Pickens.

Suburbs—Industrial: Alabama (Birmingham), Jefferson County, Precinct 40; North Carolina (Charlotte), Mecklenburg County, Paw Creek Twp. (Winston-Salem), Forsyth County, Middle Fork Twp.; Tennessee (Chattanooga), Hamilton County, District No. 2, (Knoxville) Knox County, District No. 3.

Residential—Georgia (Atlanta), College Park, Peachtree, Buckhead; Tennessee (Nashville), Davidson County, District No. 7; Virginia (Washington, D. C.), Fairfax County, Falls Church District.

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dominantly a white sample. As was previously pointed out, the nativity and religious factors are uniform in the white South and the sex ratio has been fairly well controlled in the sample. Although in the industrial suburbs the higher ratio of males and slightly greater proportion of women 25 to 34, undoubtedly contribute to the higher child-woman ratio. The important uncontrolled factors are the proportion of women married, occupational and cultural distribution, and infant mortality rate.

To test the validity of the conclusions still further, some villages and suburbs outside the South were also sampled⁵ with somewhat the same results—the agricultural villages showing the same ratio of children to women as those in the South, the industrial villages a higher ratio and the industrial suburbs a still higher ratio.

Graphic presentation of a case of the piling up of the proportion of children just outside the city limits of a new industrial center is given in Figure I showing the ratio of children under 5 to women 15-44 in Flint,⁶ Michigan, in the adjoining township, in the next township, and in villages located in those townships. This ratio is 402 in Flint, 890 in Mount Morris township, 560 in Mount Morris village, 620 in Vienna township, and 422 in Clio City.

It will be observed that the latter agricultural village drops almost as low as the city of Flint while the industrial suburban area has a ratio of children twice as high as the agricultural village. The fact which stands out is that the decline in the rate of rural non-farm increase is not a function of physical distance, but is a function of temporal distance from agriculture. The agricultural villages are generally long-settled, stable communities

⁵ Areas sampled: Rural Village—Ohio: Hicksville, Jefferson, Versailles, Waverly.

Industrial Village—Ohio: Londonville, Wellington; Wisconsin: Kohler; Vermont: Essex Town.

Industrial Suburb—Michigan: Flint, unincorporated metropolitan area; Wisconsin: Milwaukee, Cudahy.

⁶ Flint is an industrial city which had a very rapid growth between 1920 and 1930.

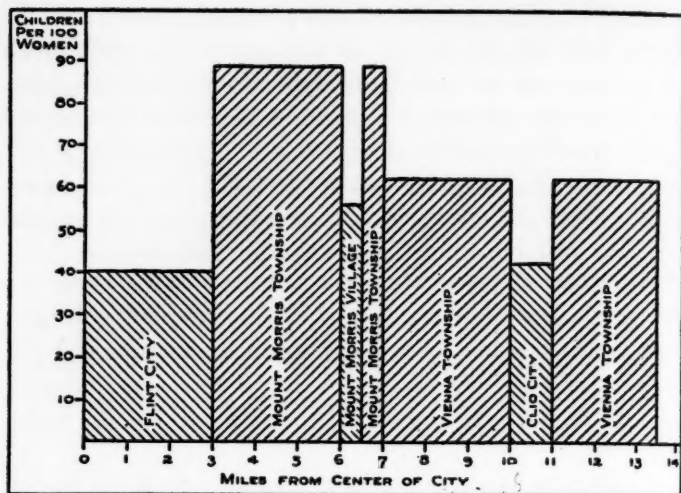


Fig. 1. Children under 5 years of age per 100 women 15-44 years of age, Flint, Michigan, and suburban areas, 1930.

composed of merchants and professional people serving the country. The textile villages and industrial suburbs are composed, especially in the South where industry is relatively new, of recently detached migrants from the farm.

This means that the high ratio of children to women in industrial suburbs and villages is not entirely the result of a high birth rate within those areas, but that families with high fertility on the farm have moved in, bringing with them a large number of children.

This temporal relationship suggests also that some of the high fertility of unskilled labor groups and miners which have been sampled in various other studies may have a similar relation to agriculture since such unskilled groups are temporally the closest to the farm.

The facts developed within the limited time at the disposal of the writer for preparing this paper seem definite enough to

warrant the hope that this field will be much more carefully explored by students of natural increase. It is suggested that specific birth and death rates as well as replacement ratios be analyzed in groups chosen so as to represent various temporal distances from agriculture. That is to say, data on births and deaths should be related not only to occupational classes, but also to occupational mobility. Such analysis must, however, be preceded by more accurate reallocation of births and deaths to place of residence. Data on replacement ratios should not only be related to types of areas but also to source and length of residence of migrants into the areas.

THE INCIDENCE AND CAUSES OF ILLNESS AT SPECIFIC AGES¹

by SELWYN D. COLLINS

IN recent years considerable thought has been given to the scrutinizing of two indexes of ill-health, namely, the rate of mortality and the rate of sickness. One of the immediate results of the consideration of the significance of these orthodox tools of the epidemiologist was the observation, pointed out some years ago by Sydenstricker (19), that the pictures resulting from their simultaneous application to a given population were by no means identical. Another result was the recognition of the inadequacy of the rate of mortality as an index of ill-health. This inadequacy has become widely known but has had no appreciable effect on current statistical practice for the obvious reason that sickness data of any useful magnitude have not been collected.

The acquisition of new and more extensive data on sickness makes it possible to compare and contrast in greater detail than heretofore the pictures indicated by the two indexes. The sickness data referred to are the records of illness for a twelve-month period among 8,758 white families in 130 localities of eighteen states that were collected by the Committee on the Costs of Medical Care and tabulated in cooperation with the United States Public Health Service. These data constitute the largest body of records of the incidence of all types of illness in the general population (all ages and both sexes) that has thus far been assembled.²

¹ From the Office of Statistical Investigations, United States Public Health Service.

For assistance in the tabulation and analysis of the data used in this study I am indebted to Dr. I. S. Falk and Miss Margaret Klem, formerly of the staff of the Committee on the Costs of Medical Care. Special thanks are also due to Dr. Mary Gover, who assisted in the analysis, to Miss Lily Vanzee, who was in immediate charge of tabulating the data, to Drs. Amanda L. Stoughton and R. R. Jones for advice and assistance in classifying the causes of sickness and death, and to other members of the statistical staff of the Public Health Service, particularly Dr. W. M. Gafafer and R. H. Britten, for advice and assistance in the preparation of the study.

² Detailed reports on these data with special reference to costs have been published by the Committee on the Costs of Medical Care (15) and further analyses of the incidence of illness have appeared in the *Public Health Reports* (6-11).

A brief summary of available records of mortality and sickness with special reference to data for specific ages may be pertinent at this time.

For many years mortality statistics have been collected by the registration method in nearly all civilized countries of the world. Detailed annual and special reports based on the registered deaths are available for the principal countries and for the various states of the United States. These data afford information on death rates for specific causes, at specific ages, for both males and females and in some countries for specific occupations, together with time trends. In contrast to this mass of more or less complete information on mortality, there are no detailed data on the extent and causes of illness for any large population group in any country.

The tenth decennial census of the United States, taken as of June 1, 1880, included an inquiry on the number of persons "so sick or disabled as to be unable to pursue their ordinary occupations" on the day of the enumeration.³ The tabulations were limited to persons over fifteen years of age and to areas where the data were thought to be complete. The census report devoted to vital statistics (4) includes rates by age and sex, based on a total of twenty million persons over fifteen years of age in nineteen states. No data were published on the causes of illness but the preponderance of chronic ailments is indicated by the rapid rise of sickness prevalence as age increases.

During the years 1915-1917, the Metropolitan Life Insurance Company canvassed families including half a million people (17) to determine the *prevalence of illness on a given day*. The results are published by cause for all ages and by age for all causes, and a few of the reports for individual localities show the numbers of cases of specific diagnoses in broad age groups.

Data on the *prevalence of illness on a given day*, such as those

³ Similar inquiries were included in the Irish censuses of 1851, 1861, and 1871, and in the Australian census of 1881.

in the two sources quoted above, are quite different from data on the *incidence* of new cases that occur *over a period of time*. The prevalence data for a given day are heavily weighted by chronic illnesses, whereas the incidence over a period of time is more largely made up of acute cases of shorter duration.

Among the sources of data on the incidence of illness are the rather incomplete reports of communicable diseases to local and state health departments. These reports (1) afford data on this limited group of diseases for states and cities but tabulations by age or in any classes except as total cases for each diagnosis by years and sometimes by months are rarely published.

Records of illness among members of sick benefit associations (3) are available in specific diagnoses but not by age. In a few special studies of industrial employees (2) and of school children (5, 14, 16, 21), sickness rates are available by age for the limited age ranges covered.

The Hagerstown study (18) shows data classified by age, sex, and cause of illness and is the only one which affords a record of sickness *incidence over a period of time* for persons of different ages throughout life; this solitary record of the incidence of illness in the general population contrasts remarkably with the wealth of mortality data available.

METHOD OF THE STUDY AND CHARACTER OF THE DATA

The periodic canvass method of collecting the data in the present study and the results obtained are similar to those for Hagerstown (18). Suitable areas to be canvassed in a state were selected by conference with the state and local health officers. The actual canvassing was done by health department or other visiting nurses in the various communities. Arrangements were made through the health officer for the nurse to do this work in addition to her regular duties, provided she was willing to undertake it. In inaugurating the study, the nurse did not include

the families to which she had already been called by sickness, but selected a new group without regard to the presence or absence of illness in the household at the time of the initial visit.

Since the work of the nurse was voluntary and was in addition to her regular duties, doubt may arise as to the care used in obtaining the data and as to the regularity of visits. However, the completeness with which the many detailed entries were made on the schedules throughout the twelve-month period indicates that sufficient care was exercised and that visits were regularly made. It is believed that the possible advantages that might have been derived from the employment of full-time paid investigators were counterbalanced to a considerable degree by the fact that the volunteer nurse carried only twenty-five to fifty families with whom she became more or less intimately acquainted. Indeed the nurse cannot be considered a truly volunteer worker since she was approached through the health officer and undertook the canvassing at his suggestion, and consequently the satisfactory performance and completion of her work became to a considerable degree something for which she was responsible to the health officer as well as to the Committee on the Costs of Medical Care.

The study covered by periodic canvasses a total of 8,758 white families including 39,185 individuals. Each family was visited at intervals of two to four months for a period long enough to obtain a sickness record for one year. On the first call a record was made of the numbers of members of the household, together with data about sex, age, marital status, and communicable disease history of each person. On succeeding visits the canvasser recorded all illness that had occurred since the preceding call with such pertinent facts about each case as the date of onset, the duration of disability and of confinement to bed, the nature of such medical service as was obtained, and the termination of the illness. Thus there are available certain facts about the observed population

and the illnesses suffered in the course of twelve months.⁴

The surveyed population was large enough to give a fair degree of reliability to sickness rates, but deaths in the group were too few to indicate the expected mortality from different causes at specific ages. Consequently, in the comparison of illness and death, mortality data from the Registration States were used. That this substitution is justifiable is indicated in later pages where a comparison is made of the death rates in the two groups. (Figures 1 and 3 and Table 1.) The illness data, as previously stated, apply to a twelve-month period for each household but the total time of observation extended over about three years, the record for the first family beginning in February, 1928, and the last one ending in June, 1931; most of the observations, however, were made in 1929 and 1930. For this reason mortality data for the Registration States for the years 1929 and 1930 were used.

DEFINITION OF AN ILLNESS AND THE CLASSIFICATION OF ITS CAUSES

Illness as here used refers to both injury and disease. What was actually included as cases, however, was necessarily influenced not only by the informant's (usually the housewife's) conception of illness but also by her memory. With visits as infrequent as two to four months, it is inevitable that many of the non-disabling illnesses would be terminated and forgotten before the next visit of the enumerator. However, if the record includes most of the real illnesses and excludes only the minor disorders, it may be as useful as a more complete one.

Illnesses that originated prior to the study and caused sickness during the year are included with those having their onset within the period of observation; 93 per cent had their onset within, and 7 per cent prior to, the year. The inclusion of these illnesses of prior onset is necessary to give proper representation to chronic ailments. A large proportion of the cases of such diseases as tuber-

⁴ Further details on the method of collecting the data and the characteristics and geographic distribution of the surveyed population are included in an earlier report (6).

culosis, cancer, diabetes, and cardio-renal affections originated prior to the study. An earlier paper shows for each diagnosis the number of cases with prior onset (6).

Considering an illness in the sense of a continuous period of sickness, one finds only 4.3 per cent designated as due to more than one cause. In general the more important or more serious cause was used as primary, except where a disease like pneumonia is commonly recognized as following measles or influenza; in such cases the antecedent condition was taken as primary.⁵ In the present paper which deals with broad disease groups, the illness rates are based on sole or primary causes only, so that a continuous period of sickness is never counted as two illnesses.

EXTENT OF ILLNESS FROM ALL CAUSES IN DIFFERENT SEVERITY CLASSES

In the present study the crude annual rate was 850 illnesses per 1,000 persons observed. Adjustment to the age distribution of the white population of the Registration States reduces this rate to 823 per 1,000. A rate so adjusted represents the rate that would obtain if the age-specific rates in the surveyed families had prevailed in a population with the age distribution of that in the Registration States. Adjustment for age is necessary before sickness rates in the surveyed population can be compared with death rates in the general population. Rates in an earlier paper (6) which dealt with sickness only were not adjusted for age and hence they are somewhat different from the adjusted rates which are used exclusively in this discussion.

The Hagerstown (18) crude annual illness rate was 1,081 per 1,000 which becomes 1,053 when adjusted for age. Although this rate is considerably above that of 823 per 1,000 for the present study,⁶ both indicate a frequency of illness of roughly one case

⁵ Further details on the method of classifying the causes of illness are included in an earlier report (6).

⁶ The excess in the Hagerstown rate over that of the present study is all in the respiratory diseases (adjusted rate for Hagerstown 649, for eighteen states 329 per 1,000), the non-respiratory rate being greater in this study (adjusted rate for Hagerstown 404, for eighteen states 494 per 1,000). A comparison of results in the two studies is made in an earlier paper (6).

per person per year. The incompleteness of this figure, so far as colds and other trivial attacks are concerned, is indicated by the results of intensive surveys in which the observed individuals made weekly or semi-monthly reports which indicated annual rates as high as three per person for respiratory affections alone (12, 13, 20). No pretense is made of such a degree of completeness in the present record but it probably includes most of the real illnesses and some of the trivial that occur with great frequency.

In addition to the rate of 823 illnesses, nearly four-fifths of which were attended by a doctor, there were 438 services per 1,000 without illness in the usual sense of the word, including vaccinations and immunizations of all kinds, physical examinations, eye refractions, and dental services.

Of the total rate of 823 illnesses, 331 were non-disabling and the remainder, 492 per 1,000, were disabling, that is, they caused the patient to lose one or more days during the year of the study from his usual work, school, play, or other activities. Of the disabling cases, 84 per cent were also confined to bed for one or more days—a rate for bed cases of 414 per 1,000 persons, leaving almost the same number, 409 per 1,000, with no days in bed. About one-fifth of the cases not in bed reported disability for one or more days (78 per 1,000 persons observed).

Of all cases reported, 79 per cent were attended by a doctor and 7 per cent were in a hospital for one or more days during the year of the study, a rate of 62 hospital cases per 1,000 persons observed. Almost as many cases (58 per 1,000 persons observed) had surgery in connection with the primary diagnosis; as some cases had surgery in connection with a contributory diagnosis and others had two or more surgical operations in connection with the same illness, there was a total of 65 surgical operations per 1,000 persons observed. The rates quoted above have all been adjusted to the age distribution of the white population of the Registration States.

Among white persons in the Registration States (1929-1930) there was an annual death rate of 11.1 per 1,000 population; in the surveyed families the death rate (adjusted for age) amounted to 9.6 per 1,000 persons observed.⁷ Infant mortality which is expressed as deaths under 1 year of age per 1,000 live births, was 61 for white infants in the Birth Registration States, 1929-1930; in the surveyed families the figure was 53 per 1,000 live births.⁷ The canvassed group included only families and would not include any representation from such institutions as almshouses, homes for the aged, hospitals for the insane, and orphanages where the death rate is usually high. Somewhat lower death rates in the surveyed group than in the general population might therefore be expected.

CAUSES OF ILLNESS OF DIFFERENT SEVERITIES CLASSIFIED IN BROAD
DIAGNOSIS GROUPS

Figure 1 shows the important causes of sickness of different types and severities discussed in the preceding section and the important causes of death. The cases are classified into the broad groups of the International List of the Causes of Death, the diseases being arrayed in each severity category according to the magnitude of the rates for the groups. The percentages are all based on adjusted rates, each being the percentage that the rate for a given diagnosis group is of the rate for all causes of the same severity category. The percentages that appear on the graph are the equivalent of the percentage of cases as they would occur in a population with the age distribution of that in the Registration States in 1929-1930.

The three bars on the right contrast the causes of sickness and death, the mortality being shown for both the Registration States and the surveyed population. It will be noted that the mortality data for the canvassed families are quite similar to those for the

⁷ All mortality data for the surveyed group are based on the families observed for a full twelve months and those observed for less than that time. All sickness data are based on the full-time families only. For further details see footnote 6 to Table 1.

(including cerebral hemorrhage) are among the four most important causes of death, but are relatively infrequent as causes of sickness. Accidents are third among the causes of sickness and fifth among the causes of death.

The three bars on the left present the causes of (a) medical care without sickness (largely preventive service), (b) sickness that did not keep the patient from his usual activities (non-disabling), and (c) sickness that caused the patient to lose one or more days from his usual work, school, or other activity (disabling). Care of the teeth and eye examinations for glasses are definitely therapeutic, but they have been included with preventive care because illness in the usual sense of the word is not commonly present at the time the service is rendered. More than three-fifths of the cases of care without illness are dental; 17 per cent are physical examinations; 11 per cent, vaccinations and immunizations of the various kinds; and 10 per cent, eye refractions. In both disabling and non-disabling illness, respiratory diseases are the outstanding cause, constituting 32 per cent of the non-disabling and 45 per cent of the disabling cases.* Accidents stand fourth in the disabling class and second in the non-disabling, evidently including a considerable number of minor injuries that did not involve loss of time from usual activities. The communicable diseases occupy second place in the disabling class, but there are also a considerable number that are non-disabling, being sixth in that class. Digestive disorders are third in importance in both classes of illness; skin affections are fourth in the non-disabling but do not appear in the disabling class, since they amount to less than 2 per cent of these cases.

The two center bars show the most frequent causes of illness that were hospitalized and that had surgical treatment. An examination of the diagnoses of hospitalized cases indicates that the

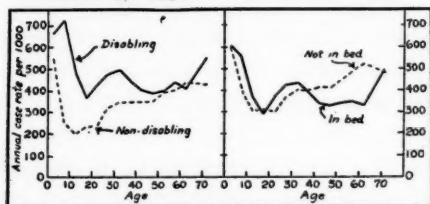
* Respiratory illnesses constitute nearly half of the cases that were in bed for one or more days (6).

hospital is used as a convenience in surgical and maternity cases as much as a concentration point for the most severe illnesses of all kinds. The four most frequent groups of hospital cases are respiratory (largely tonsil and adenoid operations), puerperal and female genital, digestive (nearly half of this group was appendicitis), and accidents. These four classes constitute more than three-fourths of the hospital cases. About 60 per cent of all hospital cases were surgical and about the same percentage of all surgical cases were hospitalized. Surgical cases show about the same picture as hospital cases, respiratory (largely tonsil and adenoid operations), accidents, digestive (largely appendicitis), and puerperal and female genital diseases being the four most frequent diagnoses in surgical as well as in hospital cases. These four causes constitute 75 per cent of the surgical cases.

AGE VARIATION IN ILLNESS OF DIFFERENT SEVERITIES

Figure 2 shows the age curve of illness from all causes classified as disabling and non-disabling (Table 1). Disabling refers to illness that causes loss of one or more days from usual activities, whether or not the individual was gainfully employed. Curves are also shown for cases that were not in bed and for those con-

Fig. 2. Age incidence of illnesses of different severity categories—censused white families in eighteen states during twelve consecutive months, 1928-1931.



fining the patient to bed for one or more days; all cases in the latter category are included in the disabling class, constituting 84 per cent of the illnesses in that group.

There is somewhat more variation with age in the non-disabling than in either the disabling or bed cases; the rise with age after 20 years is slightly greater and the rate for children under 5 years is also relatively

higher in the less severe non-disabling class. An examination of the age curves of non-disabling illness in broad diagnosis groups indicates that respiratory and digestive affections are the principal causes that contribute to the more rapid rise as age increases; it is also these groups that are largely responsible for the relatively

Table 1. Age incidence of illness of varying severity and of mortality—illness in canvassed white families in eighteen states during twelve consecutive months, 1928-1931, and mortality among white persons in the Registration States,¹ 1929-1930. (All causes; sole or primary diagnosis only.)

AGE	SURVEYED GROUP					REGISTRATION STATES	RELATION BETWEEN ILLNESS AND DEATH RATES		White Population (Years of Life) for the Registration States, 1929-1930 (in thousands)		
	Annual Illness Rates per 1,000 Population				Population (Years of Life) for Illness Data		Annual Death Rates per 1,000 Population ¹	Annual Death Rates per 1,000 Population		Estimated Case Fatality, Per Cent ³	Estimated Number of Illnesses per Death ⁴
	All Illness	Non-disabling Cases ²	Disabling Cases	Cases in Bed							
ALL AGES											
Crude	850	334	516	434	38,544 ⁵	6.90	11.07	—	—	208,492 ⁵	
Adjusted ²	823	331	492	414	—	9.58	11.07	1.35	74	—	
Under 5	1,212	548	664	609	5,513	11.11	17.11	1.41	71	18,935	
5-9	978	253	725	503	5,715	1.73	1.92	.20	511	20,904	
10-14	679	199	480	372	4,568	.98	1.46	.21	464	20,149	
15-19	599	227	372	288	3,050	2.97	2.41	.40	248	19,276	
20-24	672	242	430	373	2,119	2.71	3.37	.50	199	18,040	
25-29	798	317	481	427	2,491	2.71	3.77	.47	212	16,364	
30-34	838	343	495	435	3,149	4.30	4.30	.51	195	15,527	
35-39	792	346	446	392	3,292	4.57	5.28	.67	150	15,708	
40-44	753	349	404	339	2,638	6.98	6.98	.93	108	13,841	
45-49	737	347	390	327	1,928	6.83	9.35	1.27	79	12,166	
50-54	790	392	398	342	1,423	13.02	13.02	1.65	61	10,420	
55-59	840	402	438	348	838	21.07	19.09	2.27	44	8,283	
60-64	850	439	411	334	635	28.00	28.00	3.29	30	6,723	
65 and over	979	430	549	497	998	77.13	75.10	7.67	13	12,008	
Number of cases—all ages ⁶	32,756	12,869	19,887	16,726	—	295	2,308,648	—	—	—	

¹ Registration States included all except Texas and South Dakota in 1929 and all except Texas in 1930.

² Rates for all ages are adjusted to the age distribution of the white population of the Death Registration States, 1929-1930.

³ Percentage that death rate in Registration States is of case rate in surveyed population.

⁴ Ratio of case rate in the surveyed population to death rate in the Registration States.

⁵ "All ages" includes a few of unknown age.

⁶ The death rate in the surveyed group is based on both the families observed for a full twelve-month period and those observed for less than that time, all part-time persons in both groups being counted in the population for only the actual time under observation. As a death in the family was sometimes the reason for the discontinuance of reports, it was necessary to use both groups of families in computing the death rate. The years of life in the full- and part-time families was 42,749. All sickness data are based on the full-time families only.

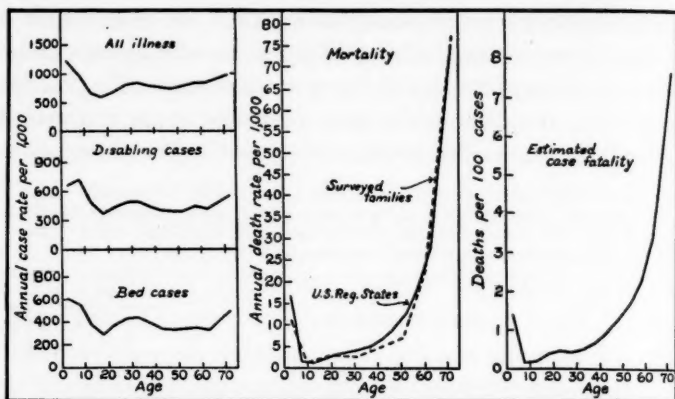


Fig. 3. Variation with age in illness, mortality, and estimated case fatality rates—illness in canvassed white families in eighteen states during twelve consecutive months, 1928-1931; and mortality among white persons in the Registration States, 1929-1930. (Scales are so made that the adjusted rate for all ages represents an interval on the vertical rate scale that corresponds to twenty years on the horizontal age scale.)

high non-disabling illness rate among children under five years.

Figure 3 shows, among other things, age-specific sickness rates in the surveyed population and age-specific mortality rates in the Registration States. The scales in both the sickness and mortality charts are so made that the adjusted rate for all ages plots on the vertical axis at a distance above the base line that is equal to the distance representing 20 years on the horizontal axis. Such an arrangement makes the relative variation with age in the sickness and death curves comparable in the same way as in curves of the ratio of the rate in each age to the rate for all ages. The variation with age is far greater in mortality than in sickness. The mortality curve increases steadily from a minimum at 10-14 years to a maximum at the oldest ages. The sickness curve has its minimum at 15-19, with a small peak at 30-34 years, followed by a decline to 45-49, and a gradual increase to the end of life. But the relative difference between sickness rates for persons over 65 and 15-19 years of age is very small as compared with the relative dif-

ference between mortality rates for the same ages. If the mortality curve were extended forward to the ages 75 and beyond, it would continue to rise rapidly, and if extended back to the age group under one year its rise would be so rapid that it would reach a height about equal to that corresponding to the oldest ages. On the other hand, if the sickness curve were similarly extended in both directions there would be practically no change in the morbidity picture. The age curves of the more serious illnesses that disabled and that confined the patient to bed do not resemble the mortality curve any more closely than does the curve of all illness.

An approximate idea of the case fatality of illness at the different ages may be obtained by relating mortality rates in the Registration States to sickness rates in the surveyed population. Considering all ages, a death rate of 11.1 when related to a total case rate of 823 per 1,000 indicates a fatality of 1.35 per 100 cases. Relating the same death rate to the disabling case rate of 492 and the bed case rate of 414 per 1,000 gives a fatality of 2.25 per 100 disabling cases and of 2.67 per 100 cases that caused confinement to bed. In other words there was a total of 74 cases of illness for each death; there were 44 disabling cases for each death; and there were 37 cases which confined the patient to bed for each death during the year.

Figure 3 shows by age the ratio of the mortality rate to the sickness rate—an estimated case fatality or deaths per 100 cases of illness. Because sickness varies from age to age much less than mortality, the age curve of the estimated case fatality is quite similar to that of mortality. If the sickness rates were the same for all ages, the denominators entering the calculation of the successive case fatalities would be the same, and hence the fatality curve would be identical in shape with the mortality curve.

The reciprocal relation of mortality and sickness in terms of the estimated number of illnesses per death at the different ages is shown in Table 1. From 511 illnesses for each death at 5-9

years, the number declines to only 13 cases per death above 65 years. Likewise, in the youngest group there are fewer cases per death, reflecting the higher fatality of illness at the extremes of life. This is also evident in the series of percentages representing the case fatality by age.

DISTRIBUTION OF INDIVIDUALS ACCORDING TO THE FREQUENCY
OF ILLNESS

An annual illness rate of one case per person does not indicate that every person was sick during the year. Such an assumption would be quite erroneous; among the nearly 40,000 individuals, each of whom was observed for twelve months, almost half (48 per cent) were not sick, about a third (32 per cent) were sick once, about one-eighth (13 per cent) were sick twice, and the other 6 to 7 per cent were sick three or more times during the twelve months of the study. Table 2 shows by age the distribution of persons according to the number of times sick and Figure 4 shows some of the data graphically. The proportions that were not sick, which might be called the "age curve of good health," reached a maximum at 15-19 years, with minima at the two extremes of life. The curve for persons sick three or more

Table 2. Age variation in the proportions of persons sick and not sick during the year under observation—canvassed white families in eighteen states during twelve consecutive months, 1928-1931.

TIMES SICK DURING TWELVE MONTHS	ALL AGES			AGE										
	Number of Per- sons	Crude	Ad- just- ed ¹	Un- der 5	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65 and Over	
		Percentage of Persons Who Were Sick the Specified Number of Times												
Not sick	18,201	47.4	48.2	32.4	41.5	54.1	58.9	55.3	48.3	50.2	51.1	46.8	39.0	
Sick once	12,352	32.1	32.1	34.7	33.6	31.1	28.7	30.2	32.1	31.4	30.8	33.1	39.1	
Sick twice	5,210	13.6	13.2	19.8	16.3	10.7	8.8	9.7	12.6	12.7	12.6	14.2	15.8	
Sick three or more times	2,658	6.9	6.5	13.1	8.6	4.1	3.6	4.8	7.0	5.7	5.5	5.9	6.1	
Number of persons under observa- tion ²		38,421		5,102	5,739	4,584	3,101	2,179	5,683	5,948	3,365	1,494	1,049	

¹ Percentages for all ages are adjusted to the age distribution of the white population of the Death Registration States, 1929-1930.

² All except 1.5 per cent were under observation during the whole twelve months; births during the study are excluded. "All ages" includes a few of unknown age.

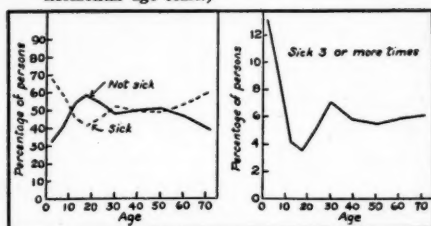
times—the “age curve of ill health”—shows the ages when individuals are likely to be ill more frequently than the average; in infancy and early childhood and 25 to 35 years of age are the two periods when individuals are most likely to suffer repeated illness during the year. The adult peak is probably due to childbearing and its attendant illnesses.

CAUSES OF ILLNESS AT DIFFERENT AGES

Figure 5 is intended to give a general view of the important causes of illness at the various ages. The total height of the bar or rectangle for a given age group represents the total sickness rate per 1,000 persons of that age; these rectangles are subdivided into smaller rectangles that represent sickness rates for the various disease classes and thus indicate the diagnostic composition of the sickness load at the various ages. The order of the diseases varies in the different age groups; the arrangement is according to the size of the rate, all diagnoses being shown that have a frequency of 20 or more per 1,000 persons observed. For example, circulatory diseases appear as third in importance in the age group over 65 years, as seventh among persons 35-44, and do not appear under 5 years because the rate is less than 20 per 1,000.

Respiratory diseases are an overwhelming part of the sickness burden at every age; accidents and digestive disorders are also frequent at all ages. The communicable diseases are important, but they become less frequent after 20 years and are replaced in the adult ages by female diseases and puerperal conditions and in the older ages by the cardio-renal, the nervous, and other pre-

Fig. 4. Percentage of persons sick and not sick during a twelve-month period—canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Scales are so made that the adjusted percentage for all ages represents an interval on the vertical percentage scale that corresponds to forty years on the horizontal age scale.)



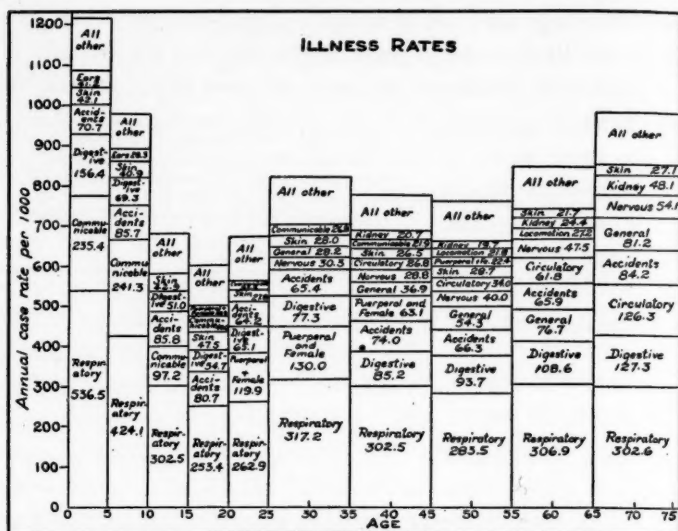


Fig. 5. Illness rates and the broad diagnosis composition of the case load at different ages—censused white families in eighteen states during twelve consecutive months, 1928-1931. (Chart shows all diagnosis groups with rates of 20 or more per 1,000.)

sumably noninfectious general diseases commonly referred to as the degenerative group.

SUMMARY

Records of illness were obtained on 8,758 white families in 130 localities of eighteen states for a period of twelve consecutive months between February, 1928 and June, 1931. Each family was visited at intervals of two to four months to obtain the data.

The surveyed families include representation from all geographic sections of the United States. Every size of community was included, from metropolitan districts to small industrial and agricultural towns and rural unincorporated areas. The observed group was fairly similar to the general population with respect to age and sex composition, percentage native born, and percentage married. With respect to income, the distribution was

reasonably similar to the estimated distribution of the general population of the United States at the time of the survey.

Mortality in the white population of the Registration States for the years 1929-1930 is used to supplement the sickness data. A comparison with the deaths in the canvassed families indicated that the use of the larger mortality experience was justifiable.

The major causes of death are not the most frequent causes of illness. The respiratory diseases are outstanding as causes of illness whether non-disabling or disabling; the degenerative diseases are more important as causes of death (Figure 1).

When illness is divided into non-disabling and disabling, and into cases in bed and not in bed, the variation with age is about as great in one class as another. The more severe cases that were in bed show a considerable peak from 20 to 40 years of age that reflects the illnesses associated with childbearing (Figure 2).

Illness is most frequent under 5 years and least frequent at 15-19 years of age. The frequency is about the same among persons 5-9 and 65 years and over. Deaths are least frequent at 10-14 and most frequent in the oldest ages (Figure 3).

Death rates vary with age far more than illness rates of any severity (Figure 3). Cases of illness per death range from 5.11 at 5-9 years to 1.3 at 65 years and over.

The proportion of the individuals that were sick three or more times during the twelve-month period of observation varies from 13.1 per cent for children under 5 years to 3.6 per cent at 15-19 years (Figure 4).

Respiratory diseases are an overwhelming part of the sickness burden at every age; accidents and digestive disorders are also important throughout life (Figure 5).

BIBLIOGRAPHY

1. Annual summaries of the notifiable diseases (a) In states (b) In large cities (c) In small cities. Published each year as reprints from or supplements to the *Public Health Reports*.

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2. Brundage, Dean K.: A 10-Year Record of Absences from Work on Account of Sickness and Accidents. *Public Health Reports*, February 25, 1927. (Reprint 1142.)
3. —: Sickness Among Industrial Employees. *Public Health Reports*, January 22, 1926 (Reprint 1060), January 17, 1930 (Reprint 1347), and May 25, 1934.
4. Census of the United States, 1880 (Tenth), Vol. XII, Mortality and Vital Statistics, Part II, Sec. IX Morbidity or Sick Rates pp. cxxxvi-cxxxix. Government Printing Office, Washington, 1886.
5. Collins, Selwyn D.: The Health of the School Child. *Public Health Bulletin* 200, August, 1931.
6. —: Causes of Illness in 9,000 Families, Based on Nation-Wide Periodic Canvasses, 1928-1931. *Public Health Reports*, March 24, 1933. (Reprint 1563.)
7. —: Frequency of Health Examinations in 9,000 Families, Based on Nation-Wide Periodic Canvasses, 1928-1931. *Public Health Reports*, March 9, 1934. (Reprint 1618.)
8. —: Frequency of Eye Refractions in 9,000 Families, Based on Nation-Wide Periodic Canvasses, 1928-1931. *Public Health Reports*, June 1, 1934. (Reprint 1627.)
9. —: A General View of the Causes of Illness and Death at Specific Ages, Based on Records for 9,000 Families in 18 States Visited Periodically for 12 Months, 1928-1931. *Public Health Reports*, February 22, 1935. (Reprint 1673.)
10. —: Age Incidence of Illness and Death Considered in Broad Disease Groups, Based on Records for 9,000 Families in 18 States Visited Periodically for 12 Months, 1928-1931. *Public Health Reports*, April 12, 1935. (Reprint 1681.)
11. —: Age Incidence of Specific Causes of Illness, Based on Records for 9,000 Families in 18 States Visited Periodically for 12 Months, 1928-1931. *Public Health Reports* (in press).
12. Collins, Selwyn D. and Gover, Mary: Incidence and Clinical Symptoms of Minor Respiratory Attacks with Special Reference to Variation with Age, Sex, and Season. *Public Health Reports*, September 22, 1933. (Reprint 1594.)
13. Doull, J. A.; Herman, N. B.; and Gafaer, W. M.: Minor Respiratory Diseases in a Selected Adult Group: Prevalence, 1928-32, and Clinical Characteristics as Observed in 1929-30. *American Journal of Hygiene*, May, 1933, xvii, No. 5, pp. 536-561.
14. Downes, Jean: Sickness Records in School Hygiene. *American Journal of Public Health*, November, 1930, xx, No. 11, pp. 1199-1206.
15. Falk, I. S.; Klem, Margaret C.; and Sinai, N.: The Incidence of Illness and Receipt and Costs of Medical Care among Representative Families. Publication No. 26 of the Committee on the Costs of Medical Care. Chicago, University of Chicago Press, 1933.
16. Nesbit, O. B.: Sickness and Absence Records in the School Health Program. Transactions of the Fifth Annual Meeting, American Child Health Association, 1928, p. 128.
17. Stecker, Margaret L.: Some Recent Morbidity Data. Metropolitan Life Insurance Company, 1919.
18. Sydenstricker, Edgar: A Study of Illness in a General Population Group. *Public Health Reports*, September 24, 1926 (Reprint 1113) and ten other papers in the *Public Health Reports*, 1926-1929.
19. —: The Prevalence of Ill Health. Bulletin of the New York Academy of Medicine, February, 1928.
20. Van Volkenburgh, V. A. and Frost, W. H.: Acute Minor Respiratory Diseases Prevailing in a Group of Families Residing in Baltimore, Md., 1928-30. *American Journal of Hygiene*, January, 1933, xvii, No. 1, pp. 122-153.
21. Wilson, Charles C.; Hiscock, Ira V.; Watkins, J. H.; and Case, Jarvis D.: A Study of Illness Among Grade School Children. *Public Health Reports*, July 31, 1931. (Reprint 1497.)

WANTED: RESEARCH IN THE ECONOMIC AND SOCIAL ASPECTS OF MEDICINE

by MICHAEL M. DAVIS, PH.D.¹

RECENT developments in medical care, public health, and social work in the United States have aroused active discussion concerning the relationships between medicine and the organized agencies of society. Numerous changes are under way in the art and organization of medical practice and in its relation to social and economic institutions. Numerous practical studies have been made, initiated by public health agencies, social workers, social scientists, and in some instances by medical associations. It is important that the data and problems of this field be investigated on an intellectual basis and not only on a controversial level. Nor should investigations be merely through studies undertaken to aid immediate practical decisions. The field is one for intellectual exploration as well as for practical action. It is desirable and timely that the field be charted intellectually; that needs and opportunities for research be defined and that projects, methods, and auspices of research be considered.

The Committee on the Costs of Medical Care, during its five years of study, 1927-1932, dealt chiefly with economic aspects, completing a number of descriptive studies of existing facilities for medical service and of plans and experiments in organized medical care; statistical studies of the incomes of physicians and dentists; of the amount and incidence of sickness among representative families and of their expenditures for various types of medical care. Some community studies of medical facilities and expenditures were also made. Practically no analytic or historical studies were pursued, and only preliminary attempts were made to study quality or adequacy of service or to develop criteria for such appraisals. The statistically recorded sickness experience of

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groups of families was not accompanied by case work or clinical studies which would have assisted the analysis and interpretation of the statistical findings.

It should be understood that this field of research does not involve merely a study of the *relations* between the medical and the social sciences, or between medical practice and social institutions. The study of these relationships is sometimes involved, but the essential elements are a body of phenomena, not merely relationships. The phenomena are such that they are influenced or "determined" both by elements which are usually regarded as "medical" and also by elements which are usually regarded as "social" or "economic." The investigation of the phenomena requires study of the status and behavior of individuals and of social groups, under conditions jointly created by biological elements, by the medical sciences and their applications, and by psychological, economic, and social factors. All the sciences and arts which are involved in medical practice, in public health and hospital administration, in economics, sociology, psychology, and social work, may be implicated in such studies.

At the present time, however, medical scientists generally regard the field as one outside their scope of intellectual interest. There are some exceptions, particularly among physicians associated with public health service, with psychiatry, or with social work. Social scientists have entered the field at certain points, but usually without recognizing that from their approach alone, the phenomena cannot be adequately studied or completely understood. There is need for techniques of the medical as well as the social scientists in gathering data, and medical and social scientists need to cooperate in the processes of analysis and interpretation.

The number of scientific groups and techniques involved suggests that research can be best pursued at universities, from the faculties of which the elements needed for any particular project

can be assembled. But other types of auspices, such as foundations, governmental agencies, or special schools or institutions, may be appropriate also. Different projects may fit different locations or auspices and it is probably desirable, at present, to diffuse research in this field rather than attempt to concentrate it in one or two places. This field of research may develop an intellectual unity of its own, such as biochemistry or genetics, each of which has developed out of originally "independent" sciences.

For purposes of illustration and suggestion, it may be well to outline some subjects for research. The field may conveniently be divided into five areas of investigation. The boundary lines will overlap. No attempt is made at completeness or at a logical order in the following lists.

1. The first general heading might be designated as public health or community studies. An outstanding problem here is the subject of morbidity. In the past, the knowledge of the amount of sickness has been limited to the few reportable diseases and to information secured from special studies. Recently, enough comprehensive sickness studies have been made to give a substantial amount of information, and data is also accumulating from industrial and other sources. Morbidity in various forms is becoming a more significant measure of health or of ill health in a community than is the death rate. Studies of morbidity of various types need to be made and correlated with economic status, with housing, and with the amount and kinds of medical care received by different groups. Morbidity needs to be evaluated in terms of its usefulness as a yardstick of community well-being or the reverse. The psychological and economic factors which affect morbidity need study as well as the physiological factors in view of the increasing amount of chronic or long-continued disease as distinguished from the acute and self-limiting sicknesses.

Studies of the utilization of medical services by individuals and families and of family expenditure for medical care were devel-

oped considerably by the Committee on the Costs of Medical Care. These need to be carried out in particular localities for particular groups of the population so that a wide variety of comparative data shall be available for understanding the conditions determining the amount of demand for medical services and the degree of utilization of medical facilities.

Studies of medical facilities in personnel and in institutions should be developed on a regional or community basis, with particular regard to the interrelations between communities of different sizes. There is evidence that the medical facilities in the smaller communities are not sufficient to constitute these areas as self-sufficient medical units, a considerable volume of medical service being sought in larger communities. This step-up process goes all the way, till in the major medical centers, chiefly but not always in very large cities, we find a substantial amount of the service rendered by physicians and hospitals furnished to persons who come from outside the community and often from considerable distances. These geographical relationships between communities with respect to the utilization of medical facilities have been but little explored. Knowledge upon this point is necessary to an understanding of the economic and social elements constituting the medical services of an area and is also fundamental to planning the distribution of medical personnel and institutions.

Another type of study which may be classed within the public health or community field relates to experiments and plans in organized medical services, such as voluntary health insurance schemes, public medical services, health demonstrations, group practice plans in hospitals, clinics, private groups, *et cetera*. A number of descriptive studies of such plans and experiments have been made. It is important to place such studies upon a scientific basis, so that they shall include professional, administrative, and financial appraisals of the scope and quality of service. Thus far the only basis for such appraisals, except on the financial side, has

been the considered opinion of some specialists in the particular type of work examined. Criteria are needed for the appraisal of the professional and administrative aspects of organized medical services and of the quality of care for various diseases and conditions. To develop such criteria is a major challenge to physicians, public health workers, and medical administrators. Surveys and appraisals of health insurance and public medical services in foreign countries also need to be made thoroughly and from the same point of view.

2. The second main group may be called sociological studies. The following brief list will be illustrative:

Scientific (technological) and social elements in recent changes in the status and relationships of medical services.

Similar study in relation to hospitals and clinics.

Rate of application of various inventions in preventive and curative medicine and correlation with social and economic factors.

Concept and literature of "social medicine" in Europe.

Medical care as an aspect of current culture.

Ecological studies of the distribution of physicians (a) in large cities, (b) in rural areas, with particular reference to young physicians. Similar study of hospitals, particularly of proprietary hospitals.

Obviously these sociological studies can be approached from the historical as well as from the analytic standpoint. From the historical point of view, special phases of the medical field or of particular "inventions" may be traced with reference to the technical and the social elements which played a part in their development and in their application in medical practice. From the same approach should proceed general historical studies in the development of medicine as an aspect of culture and biographical studies in which social and economic factors are given their due place.

3. A third main grouping of studies is economic. Research in the economic relations of medicine may include a great variety

of practical subjects, some of which are touched under the administrative heading below. Some of the studies suggested under the public health heading are largely economic in their content. The sources and amounts of incomes of the practitioners and agencies furnishing medical care are significant matters needing continued investigation. Income has been increasing from sources other than fees from individual patients. These changes in the sources of income affect the amount of expenditure for medical care and the amount and types of services utilized.

Very little attention has been given to the economic theory of medical services, although the nature and relations of these services present fascinating opportunities for economists of an analytic bent. Among examples are such subjects as:

The elements of demand for medical service; the inter-relations and relative weight of these elements; the measures of demand.

Analysis of "free choice of physician" in its psychological, professional, and economic implications.

Amount and incidence of capital charges involved in medical services.

Value and pricing of medical services.

4. The fourth area of research may be designated the clinical field. The cooperation of physicians is particularly needed in most of these studies, since they involve the investigation of individuals with biological, pathological, social, and economic elements all to be considered. As illustrations might be mentioned:

The medical, social, and economic elements in various diseases, including consideration of etiology, character and duration of treatment, cost of diagnosis and treatment, and physical, economic, and social effects. This involves case and statistical studies.

Special consideration of certain chronic diseases from the same points of view.

The cost of various diseases for diagnosis and treatment,

considering comparative costs under various methods of treatment, or various conditions of organization of service.

Birth control. (a) Effectiveness of various methods (including the "safe period") correlated with economic and social status. (b) Cost of various methods, and of the commodities utilized.

5. The fifth area of investigation may be called the administrative. A growing proportion of medical care in sickness and the larger part of preventive service are now furnished through organizations rather than by individual practitioners. The character of the organizations and of their administration becomes a significant element which conditions the medical service itself and which also has substantial effect upon its availability and its costs. The following topics might be mentioned:

Organized practice as compared with individual practice with reference to efficiency and costs (development of a comparable cost accounting).

Costs of service in organized medical practice. (a) General analysis of costs. (b) Costs of particular functions or departments. (c) Costs of certain preventive services under organized and under practitioner administration.

Characteristics and qualifications of personnel for various functions in organized medical services.

Units and terminology for the statistics of organized medical care and of administrative practice in hospitals and clinics.

The production and distribution of medical commodities as a business, *e.g.*, X-ray, eye glasses, surgical appliances, certain hospital supplies.

Studies of various administrative, financial, and community problems of hospitals and clinics.

Some of the topics under the five headings have already received considerable study. Others have been touched little if at all. Numerous other topics could be added to the lists. Obviously any comprehensive programs of research should include a critical survey of investigations already made in each area; but "compre-

hensive programs" are no more important than the initiative of individual investigators who hunt on their own. Medicine is old; organized medical research is young; social and economic research is still younger; the areas of joint interest are, from the intellectual standpoint, in their infancy. Men long dealt with health as part of the realm of magic; only very slowly have parts of it come under scientific and conscious control. We now see that the field of health involves not the body alone, nor even body plus mind, but body and mind in the physical and social setting of the human species. From this approach either the medical scientist or the social scientist can pursue useful inquiries; but for comprehensive studies, still more for serviceable interpretations of data, there must be cooperative activity. The tillage of the field promises rich intellectual and human returns.

A STUDY OF PREGNANCY WASTAGE

by REGINE K. STIX, M.D.¹

THE rapid decline of the birth rate during the past decade and the continuing unfavorable maternal mortality rate in the United States have focused increasing attention on the problem of pregnancy wastage, and particularly on that of illegal abortion. Yet data concerning either the amount of such wastage or its public health implications remain far from adequate. Such reports as are available estimate that from 18 to 25 per cent of the large number of maternal deaths in this country are due to abortion. The number of abortions occurring annually in the United States is a matter of conjecture but Taussig, who has studied the problem in great detail, suggests that 700,000 is a conservative estimate.² Apparently they are much more common in urban than in rural districts. Taussig believes that we may "justly assume a minimum ratio of one abortion to two and one-half confinements in the cities, and a ratio of one abortion to five confinements in the country districts."³ There is also a general impression that abortions recently have become increasingly common. This impression has been confirmed in one area by Millar who finds, in his study of the records of the Cincinnati General Hospital, that the abortion index increased much more rapidly than the birth index between 1918 and 1932.⁴

These crude estimates of the gross magnitude of the problem leave the most important matters untouched. They do not indicate the proportion of abortions which are spontaneous and the proportion which are induced. They tell us nothing of the con-

¹ From the Milbank Memorial Fund.

² Taussig, Fred J., M.D.: "Abortion in Relation to Fetal and Maternal Welfare." A chapter in FETAL, NEWBORN AND MATERNAL MORBIDITY AND MORTALITY. A publication of The White House Conference on Child Health and Protection. New York and London, D. Appleton-Century Company, 1933, p. 449.

³ *Ibid.*

⁴ Millar, William M., M.D.: Human Abortion. *Human Biology*, May, 1934, vi, No. 2, pp. 271-307.

ditions which stimulate or inhibit recourse to induced abortion, or of the extent to which such abortions serve as the only method of birth control. Nor do these general estimates indicate the health hazards of abortion or the relative incidence of complications in each type.

About these matters, case histories of patients of birth control clinics afford virtually the only source of information. Any abortions in the patient's history are things of the past about which she is usually willing to give information if she believes it to be relevant and confidential. In general, patients of birth control clinics can be interviewed at the time and under the circumstances best calculated to elicit accurate and complete information. The most extensive study thus far made of pregnancy wastage based on this type of data is that by Kopp, included in her analysis of the case histories of ten thousand patients of the Birth Control Clinical Research Bureau of New York.⁵

The present study, like Kopp's, deals with patients of the Birth Control Clinical Research Bureau. It differs from hers in being an intensive study of a small number of patients from whom detailed information was secured through personal interview in their homes.⁶ Every effort was made to obtain records as accurate as possible by this method. However, any conclusions which may be drawn cannot be considered to have universal application, since they are based on the experience of a small group of women who expressed interest in birth control by attending a birth control clinic. The women may be less conservative than the average, and they apparently were more fertile than the population at large. Both these factors might lead them to resort to abortion more readily than would other women. A further limitation of the study lies in the fact that since all the women were living at the time of interview, it can yield no information concerning

⁵ Kopp, Marie: *BIRTH CONTROL IN PRACTICE*. New York, Robert M. McBride and Company, 1934.

⁶ The interviews were conducted by the author.

deaths due to abortion. It is also extremely unlikely that there were any women in the group who had become sterile, either because of abortion or for other reasons.

The 991 women whose pregnancies were studied came to the Birth Control Clinical Research Bureau from the Borough of the Bronx between January 1, 1931 and June 30, 1932. Two-thirds of the families in the group were Jewish, one-sixth were Catholic, and the remainder were either Protestant or mixed marriages. Half the women were foreign born, a fact which must be remembered when they are compared with other groups. The families were from the middle and working classes and their incomes had been greatly reduced by the depression. The women were very fertile for an urban group but, with the exception of the Catholics, apparently no more so than other women of the same Borough in similar social-economic conditions and with similar religious backgrounds.⁷

Each woman interviewed gave a complete fertility history dating from marriage, in which were detailed the following items: number of pregnancies, in order, with date and type of termination of each pregnancy and entry of any pregnancy complications; type of contraceptive practice preceding each pregnancy, and whether it was interrupted to permit conception or whether the conception was accidental; whether the patient did or did not attempt abortion when she found she was pregnant, and if there was induced abortion, whether the agent was a physician,

⁷ Data are not available for a group of women comparable in these respects with the entire clinic sample, but a health survey in one district of the Bronx (Mott Haven) provided data for an unselected sample of 661 women aged 20 to 44 years which is believed to be comparable with the 232 women in the clinic sample who lived in this part of the Bronx. The live birth rates for each religious group, standardized by age and nativity, are given below:

	LIVE BIRTHS PER 100 WOMEN		
	Jews	Catholics	Protestants and Others
Clinic sample	236	366	198
Health survey sample	239	314	232

a midwife, or the patient herself. All terminations of previable pregnancies were designated as abortions, which have been classified as spontaneous, therapeutic, and illegally induced. In order to keep the records as accurate as possible, all so-called drug-induced abortions of less than two months' gestation were excluded unless they had been diagnosed by a physician, or unless there was other concrete evidence, such as hemorrhage or the necessity for curettage, to show that the patient actually had been pregnant. The exclusion of these doubtful pregnancies may have resulted in an understatement of the number of abortions, but the evidence from the records,⁸ as well as the opinion of gynecologists of experience, leads to the belief that a complete abortion induced by drugs is the exception rather than the rule. It is possible that this procedure has yielded a lower percentage of uncomplicated self-induced abortions than would have been found had it been possible to diagnose the pregnancies directly. This should be borne in mind when the question of complications is discussed.

The women of this group had been married an average of 8.5 years when the period covered by this part of the study came to an end.⁹ They had had 3,106 pregnancies, of which 35 were premarital conceptions. In spite of the high birth rate of the group, live births accounted for only a little more than two-thirds of all the pregnancy terminations. Of the remaining pregnancies, a few were terminated by spontaneous abortion, stillbirth, or therapeutic abortion, but most of the fetal loss was due to illegally induced abortion.

The gross figures for the entire sample have a rather limited usefulness because of the unusual religious distribution of the women under consideration. The proportion of Jews was large

⁸ There are in our series over 650 recorded instances in which the patient admitted taking abortifacient drugs early in a pregnancy which was later terminated by instrumental abortion or full-term birth.

⁹ This article relates only to the experience of the group before attending the Birth Control Clinical Research Bureau.

even for a New York City population but there were so many Catholic, Protestant, and mixed marriages that the sample could not be studied as an exclusively Jewish group. Since there are definite religious teachings concerning both abortion and contraception, it seemed likely that the classification of the data by religious affiliation would increase their general usefulness. Accordingly in most of what follows, the data are shown separate for Catholic women whose husbands were Catholic, Jewish women whose husbands were Jewish, and, since there were too few Protestants to warrant separate classification, a residual group comprising Protestants and all women whose husbands' religious affiliations differed from their own. It should be observed that nothing is known of the actual religious beliefs of the people interviewed except their religious affiliations as they themselves represented them, and that since all of the women considered were patients of a birth control clinic, they may not be considered a representative sample of their own religious groups.

Table 1 shows the distribution of pregnancies by types of termination for each religious group. The per cent of pregnancies terminated by stillbirth, spontaneous abortion, and therapeutic abortion does not vary significantly with religion, but the proportion terminated by live birth and illegal abortion shows

Table 1. Distribution of pregnancy terminations by type, for each religious group.

RELIGION	TOTAL PREG- NANCIES	PER CENT OF TOTAL PREGNANCY TERMINATIONS					
		Total	Live Births	Still- births	Abortions		
					Spon- taneous	Thera- peutic	Illegal
TOTAL	3,106	100.0	69.4	1.3	6.0	1.2	22.1
Catholic	646	100.0	74.0	1.7	4.8	0.8	18.7
Jewish	1,975	100.1	69.1	1.2	6.2	1.4	22.2
Protestant and Other	485	99.9	64.7	1.2	6.8	1.0	26.2

RELIGION	WOMEN	TOTAL PREG- NANCIES	LIVE BIRTHS	STILL- BIRTHS	ABORTIONS			
					Total	Spon- taneous	Thera- peutic ¹	Illegal
	NUMBER							
TOTAL	991	3,106	2,156	41	909	186	37	686
Catholic	165	646	478	11	157	31	5	121
Jewish	663	1,975	1,364	24	587	122	27	438
Protestant and Other	163	485	314	6	165	33	5	127
	NUMBER PER 100 WOMEN							
TOTAL	—	313.4	217.6	4.1	91.7	18.8	3.7	69.2
Catholic	—	391.5	289.7	6.7	95.2	18.8	3.0	73.3
Jewish	—	297.9	205.7	3.6	88.5	18.4	4.1	66.1
Protestant and Other	—	297.5	192.6	3.7	101.2	20.2	3.1	77.9

¹ Includes 7 ectopic pregnancies.

Table 2. Pregnancy terminations of each type per 100 women, for each religious group.

considerable variation. Among Catholics the proportion of live births was high and that of illegal abortions correspondingly low. In other religious groups the low proportion of live births was balanced by a high proportion of illegal abortions.

The smaller proportion of pregnancies terminated by illegal abortion in the Catholic than in the Jewish group does not represent a smaller number of abortions per woman, as will be seen in Table 2. The Catholic women, because they made less use of contraception,¹⁰ became pregnant more times than the Jewish women, so that even though a smaller proportion of their pregnancies was terminated by illegal abortion there was a slightly larger number of those abortions per woman. In each religious group about 35 per cent of the women had resorted to illegal abortion at least once. About 16 per cent of the Catholics and 20 per cent of the Jews had done so only once, but 6 per

¹⁰ Stix, Regine K., M.D., and Notestein, Frank W.: Effectiveness of Birth Control. A Second Study of Contraceptive Practice in a Selected Group of New York Women. *The Milbank Memorial Fund Quarterly*, April, 1935, xiii, No. 2, pp. 162-178.

cent of the Jews and 11 per cent of the Catholics had experienced three or more illegal abortions.

Dr. Kopp's material shows somewhat higher abortion and pregnancy rates per woman than the present study, but the relative differences in the three religious groups are similar.¹¹ Both studies point to the fact that the incidence of induced illegal abortion is extremely high in a group of fertile women who sought birth control information, and that all other types of pregnancy wastage are relatively unimportant numerically.

The importance of the pressure of a rapidly growing family as a spur to induced abortion may be seen clearly in Table 3 which shows total pregnancy rates¹² for each five-year duration of marriage by religion, and the distribution of pregnancy terminations in relation to each rate. Figure 1 presents this material graphically. Total pregnancy rates for each group declined markedly as marriage lengthened. This was due to two factors: First, more couples used contraceptives as the duration of marriage lengthened, and second, apparently contraception was used more effectively as time went on. The proportion of pregnancies terminating in live births declined rapidly with increasing length of marriage in each group, and there was a corresponding rise in the proportion terminated by illegally induced abortion. Although the pregnancy rates were higher among Catholics than among other groups, and the proportion of live births was higher,

¹¹ Kopp. *Op. cit.* From material presented in Tables III and XXX it appears that there were approximately 112 abortions per 100 women. The corresponding ratio found in the present study is 92 (Table 2). The difference probably is due to the rigid exclusion of so-called drug abortions from the present study. When Kopp's material is adjusted to show the same proportion of self-induced abortions as that found here, the total number of abortions and of pregnancies in her group is reduced by at least 14 per 100 women.

¹² For method of computing pregnancy rates see: Stix and Notestein: Effectiveness of Birth Control. Milbank Memorial Fund *Quarterly*, January, 1934, xii, No. 1, pp. 59-64. Briefly, the rates represent pregnancies per 100 years of exposure to the risk of pregnancy of the whole group, individual exposure being the sum of those periods of each woman's life when she was living with her husband and not pregnant. The rates in this table are derived by combining exposure and pregnancies when contraception was used with exposure and pregnancies when none was used.

the same general time trend was apparent in the Catholic as in the other two groups.

Early pregnancies apparently were welcome in almost all families, for less than one-fifth of all the first pregnancies were accidental. On the other hand, nearly three-fourths of the few

Table 3. Pregnancy rates, and percentage distribution of pregnancies by type of termination, for specified periods of married life and each religious group.¹

PERIOD OF MARRIED LIFE	PREGNANCIES PER 100 PERSON-YEARS EXPOSURE	PER CENT OF TOTAL PREGNANCY TERMINATIONS			
		Total	Live Births	Illegal Abortions	Other Pregnancy Wastage
ALL RELIGIONS					
TOTAL	48	99.9	69.1	22.2	8.6
0- 4 years	68	100.0	76.9	14.9	8.2
5- 9 "	36	100.0	60.2	31.4	8.4
10-14 "	28	100.0	45.4	43.3	11.3
15-29 "	18	100.1	49.3	42.3	8.5
CATHOLIC					
TOTAL	70	100.0	73.9	18.6	7.5
0- 4 years	93	100.0	80.4	11.2	8.4
5- 9 "	53	100.0	68.3	26.1	5.6
10-14 "	49	100.0	50.8	42.9	6.3
15-29 "	27	100.0	53.8	46.2	0.0
JEWISH					
TOTAL	42	100.0	68.8	22.3	8.9
0- 4 years	61	100.0	77.0	14.8	8.2
5- 9 "	31	100.0	60.0	30.9	9.1
10-14 "	23	100.0	44.0	44.6	11.4
15-29 "	18	100.0	47.2	41.5	11.3
PROTESTANT AND OTHER					
TOTAL	56	99.9	64.0	26.8	9.1
0- 4 years	71	99.9	72.0	19.9	8.0
5- 9 "	43	100.0	50.0	40.8	9.2
10-14 "	39	99.9	43.2	37.8	18.9
15-29 "	13	100.0	60.0	40.0	0.0

¹ The data from which the rates and distributions are derived are shown in Table 4.

conceptions, which took place in the period from 15 to 29 years after marriage, occurred while contraceptives were being used. It appears that after these women felt they had had enough children, they first used whatever contraceptives they chanced to know about, and when these failed they frequently had the re-

Table 4. Data from which pregnancy rates and percentage distribution of pregnancy terminations shown in Table 3 are derived.¹

PERIOD OF MARRIED LIFE	PERSON-YEARS EXPOSURE TO RISK OF PREGNANCY	PREGNANCY TERMINATIONS			
		Total	Live Births	Illegal Abortions	Other Pregnancy Wastage
ALL RELIGIONS					
TOTAL	6,419.9	3,071	2,123	685	263
0- 4 years	2,873.7	1,943	1,494	289	160
5- 9 "	2,145.6	773	465	243	65
10-14 "	1,015.3	284	129	123	32
15-29 "	385.3	71	35	30	6
CATHOLIC					
TOTAL	912.3	640	473	120	47
0- 4 years	434.9	403	324	45	34
5- 9 "	302.1	161	110	41	9
10-14 "	127.5	63	32	27	4
15-29 "	47.8	13	7	6	0
JEWISH					
TOTAL	4,658.6	1,958	1,347	438	173
0- 4 years	2,000.9	1,229	946	182	101
5- 9 "	1,565.8	492	295	152	45
10-14 "	792.5	184	81	82	21
15-29 "	299.4	53	25	22	6
PROTESTANT AND OTHER					
TOTAL	849.0	473	303	127	43
0- 4 years	437.9	311	224	62	25
5- 9 "	277.7	120	60	49	11
10-14 "	95.3	37	16	14	7
15-29 "	38.1	5	3	2	0

¹ Exclusive of 35 pre-marital conceptions which terminated as follows: live births, 33; stillbirth, 1; illegal abortion, 1.

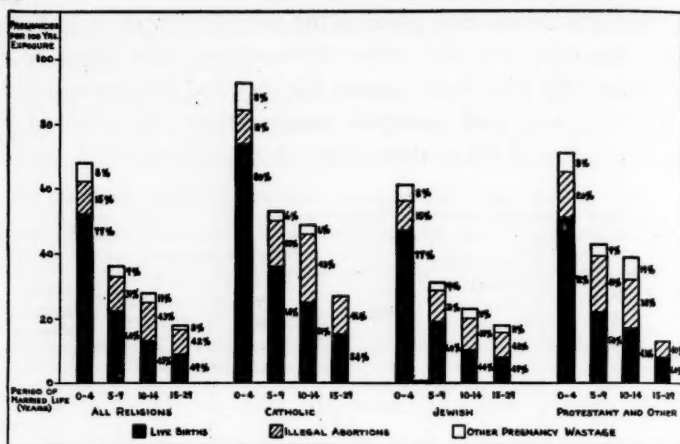


Fig. 1. Comparison of pregnancy rates per 100 person-years exposure to pregnancy, and distribution of pregnancy terminations by type in specified periods of married life, for each religious group.

sulting pregnancies aborted. However, there were not more abortions per woman in the later age periods than in the earlier. Actually the number of pregnancies was so much reduced by the use of contraceptives that the number of abortions was small, though the proportion of pregnancies aborted was large.

The use of induced abortion as a secondary rather than a primary method of birth control is shown more clearly in Table 5. Nearly 40 per cent of the accidental pregnancies (pregnancies experienced while contraceptives were being used) were terminated by illegal abortion, while less than 4 per cent of those pregnancies experienced when no contraceptives were used were so terminated. There was no significant change in the per cent of pregnancies terminated by wastage other than illegal abortion with increasing length of marriage, and the per cent of such loss in accidental pregnancy was essentially the same as in pregnancy occurring when no contraceptives were used.

Kopp's material shows the increase in abortion with increasing

TYPE OF PREGNANCY TERMINATION	DISTRIBUTION OF PREGNANCY TERMINATIONS			
	Per Cent		Number	
	No Contra- ceptive Used	Contracep- tives Used	No Contra- ceptive Used	Contracep- tives Used
TOTAL	100.0	100.0	1,438	1,633
Live births	88.1	52.4	1,267	856
Illegal abortions	3.5	38.9	50	635
Other pregnancy wastage	8.4	8.7	121	142

¹ Exclusive of 35 pre-marital conceptions which terminated as follows: live births, 33; stillbirth, 1; illegal abortion, 1.

Table 5. Distribution of pregnancy terminations by type for pregnancies conceived when contraceptives were used and when none was used.¹

order of pregnancy.¹⁸ Only 10 per cent of first pregnancies in her series were aborted, but the proportion rose sharply with succeeding pregnancies. After the sixth pregnancy nearly 50 per cent of all pregnancies were terminated by abortion.

The rise in the illegal abortion rate with increasing length of marriage, as shown in Table 3, represents a composite picture of the performance of women of various ages. A more detailed analysis is presented graphically in Figure 2, which shows the distribution of pregnancy terminations in corresponding periods of married life for women married different lengths of time. Of the four groups of bars, that at the top relates to the most recent marriages, which were contracted in the years 1927-1931; that at the bottom to those which date back to the years 1905 to 1916. In each of the four groups, the individual bars represent the experience during each five-year period of married life, showing the proportion of pregnancies terminated by live birth, illegal abortion, and other pregnancy wastage.

Two definite trends appear: (1) Comparison of the bars for the different periods of married life of women married in the same group of years shows that the longer the women were married, the larger the proportion of pregnancies which were terminated by illegal abortion, and the smaller the proportion ter-

¹⁸ Kopp, Marie: *Op. cit.* Table VIII. This includes all types of abortion.

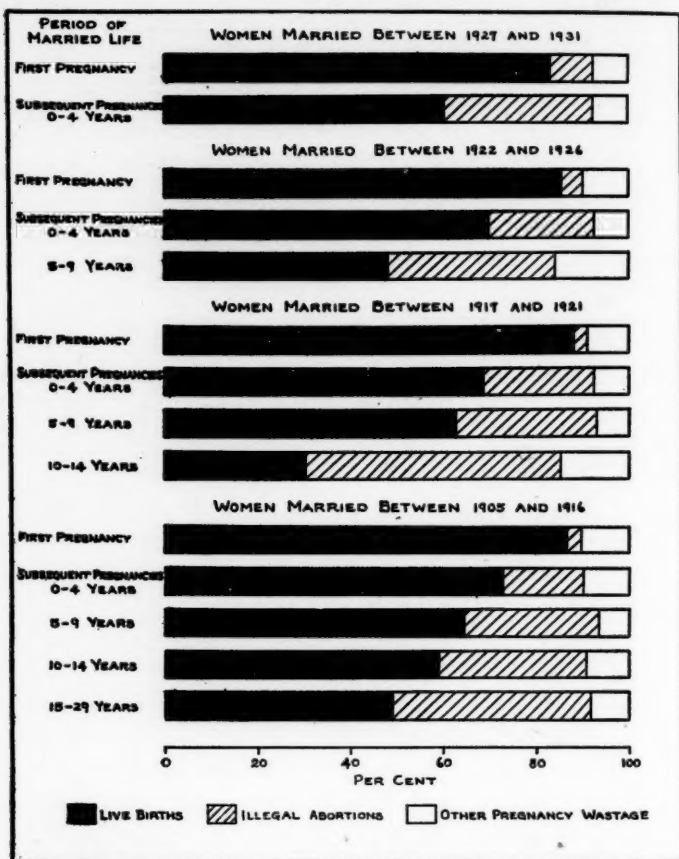


Fig. 2. Per cent of pregnancies terminated by live birth, illegal abortion, and other pregnancy wastage in each period of married life, for women married different lengths of time.

minated by live birth; (2) comparison of the bars for corresponding periods of married life of women married at different dates shows that during the past 25 years there has been a marked increase in the proportion of pregnancies terminated by illegal abortion.

So far as the group under consideration is concerned, apparently the younger generation has a changed attitude toward abortion. The early abortions in the youngest group of women were frequently followed by planned pregnancy. In many cases the patient went to an abortionist because she was the bread-winner in the family and could not afford to lose her job, much less produce another mouth to feed. A year or two later, if her husband was working, she gave up her job and planned a baby or two. In comparing the same periods of married life throughout it is apparent that the younger the women the larger the proportion of pregnancies illegally aborted. This trend is particularly striking when the lowest bar in each group is compared with the bar for the same period in the next older group. Since each lowest bar represents the period which includes the years 1929-1931, the sharp rise in abortion rates may be somewhat influenced by the depression, a factor which did not enter into the corresponding experience of women for whom the same period of married life came earlier.

The incidence of pregnancy wastage other than illegal abortion appears to be practically unchanged throughout the twenty-five-year period. Such slight differences as appear in Figure 2 are doubtless due to variations arising from the small number of cases. The consistency of this finding under all types of analysis may be of considerable importance in interpreting other data on pregnancy terminations in which the manner of abortion may be in question.

A detailed study of the methods by which abortion was obtained, and the complications incidental to abortion, may throw more direct light on the public health aspects of the problem. In appraising this portion of the report, the reader should remember that the only source of material is the patient, and that when she said that a "doctor" performed an abortion, she may have been referring to someone who was unlicensed or not a physician

RELIGION	TOTAL ILLLEGAL ABORTIONS	PER CENT			
		Total	Physician	Midwife	Self
ALL RELIGIONS	686	100.0	74.2	19.7	6.1
Catholic	121	100.0	48.8	41.3	9.9
Jewish	438	100.0	87.9	7.5	4.6
Protestant and Other	127	100.0	51.2	40.9	7.9

Table 6. Distribution of illegal abortions by agents inducing abortion, for each religious group.

at all. Similarly, information regarding complications was not taken from hospital records, but was the statement of the patient concerning what she thought was wrong with her or what she had been told was wrong with her.

Since induced abortion is illegal in the United States excepting under conditions strictly defined by law, it is important to know who induces non-therapeutic abortions. Analysis of all illegal abortions by agent of termination (Table 6) shows that nearly 75 per cent of abortions in this group were induced by physicians, about 20 per cent by midwives,¹⁴ and the remainder by the woman herself.¹⁵ When the group is subdivided by religion, interesting differences appear. Jewish women had 88 per cent of their abortions induced by physicians, and less than 5 per cent were self-induced. In the other two religious groups, only about 50 per cent of the illegal abortions were induced by physicians and nearly 10 per cent were self-induced. Of all the self-induced abortions, about one-fourth were due to instrumental interference, and the remainder were induced by abortifacient drugs. In a few of these cases, the diagnosis of pregnancy had been made by the patient's family physician, and the remainder were incomplete abortions followed by curettage.¹⁶

¹⁴ These include one abortion performed by a neighbor of the patient.

¹⁵ For reasons discussed above, Kopp's study shows a much higher proportion of self-induced abortions (Kopp, *op. cit.*, Table XXX). When this difference is taken into account, the proportions of abortions performed by doctors and midwives are about the same as those found in the present study.

¹⁶ About twenty women were asked the price of induced abortion at interview, and
(Continued on page 361)

Nearly 90 per cent of the illegal abortions were induced before the third month of pregnancy, and less than 1 per cent terminated after the fourth month. On the other hand, less than half

Table 7. Relative frequency of curettage in various types of abortion.

Type of Abortion	Number of Abortions	Frequency of Curettage (Per Cent)
Spontaneous	171 ¹	52.0
Therapeutic	30 ²	90.0 ⁴
All Illegal Abortions	674 ³	86.1
By physician	509	95.9
By mid-wife	123 ³	58.5
Self-induced	42	47.6

¹ 15 unknown.

² Exclusive of 7 ectopic pregnancies.

³ 12 unknown.

⁴ Remaining cases: 2 induced labor, 1 X-ray.

of any kind is less dangerous before the third month, the fact that the illegal abortions were induced very early may account for the relatively few complications in this series of cases.

Table 7 shows the incidence of curettage in all types of abortion. About half the spontaneous abortions were followed by curettage. Of the illegally induced abortions a large proportion either included or were followed by curettage. It accompanied almost all of the abortions induced by physicians but a relatively small proportion of those induced by midwives. Nearly half the mid-wife-induced abortions were spontaneously delivered following instrumental dilatation. Of the self-induced abortions, 48 per cent were followed by curettage, and all of these were incomplete. Each patient was asked specific questions about the instrumental

the range of answers may be of some interest. The highest price was \$200, and the lowest \$2.00, with about \$60 as the average. In three cases the charges were by midwives and were, respectively, \$35, \$40, and \$60. The two-dollar abortions were done by a man described by the patient as a doctor. She assured the author that his patients were given slips of paper with numbers on them and waited in line. She also said she thought his instruments were rusty. The patient had returned to this "doctor" a number of times, in spite of having had one abortion followed by severe septicaemia and two by serious hemorrhage.

the spontaneous abortions took place before the third month, and 11 per cent terminated after the fourth month. Therapeutic abortions were undergone relatively late in pregnancy, nearly 17 per cent being induced after the fourth month and only 57 per cent before the third. Since abortion

TYPE OF ABORTION	TOTAL NUMBER	PER CENT			
		No Com- plications	Hemorrhage	Infection	Other Pathology
Spontaneous	186	75.8	22.0	2.7	0.5
Therapeutic	30 ^a	90.0	3.3	0.0	6.7 ^b
All Illegal Abortions	686	86.0	7.9	3.4	5.5
By physician	509	91.2	4.7	2.8	2.9
By midwife	135	85.9	10.4	4.4	0.7
Self-induced	42	23.8	38.1	7.1	52.4 ^c

^a Two types of pathology occurred simultaneously in a number of cases.

^b Exclusive of 7 ectopic pregnancies.

^c 3.3 per cent (1 case) probable sterility following X-ray abortion.

^d 47.6 per cent incomplete.

Table 8. Incidence of complications in various types of abortion.¹

procedure, and the patients' replies were the source of the recorded data.

It is difficult to estimate the effect of this very large number of abortions on the health of a group of women who by the process of selection must have been among those least injured by the procedure. Table 8 shows the distribution of complications following all types of abortion. From this tabulation it appears that therapeutic abortion is one of the least dangerous of all types of abortion. This is in spite of the fact that in 37 per cent of the therapeutic abortions, the patient was ill at the time of the abortion and a bad surgical risk because of toxæmia or severe systemic disease¹⁷ while less than one per cent of all other types of abortion occurred during the illness of a patient.

Infection appears to have been comparatively rare in this group of women. This may be because slight infection was overlooked and therefore not reported by the patient, or it may be because one could not expect to find a high incidence of pelvic infection in a group as fertile as this one. Not one of the therapeutic abortions was reported as followed by infection, and the next lowest

¹⁷ The remainder of the therapeutic abortions were done because of previously complicated pregnancy or arrested tuberculosis, and these patients did not therefore present serious surgical risk at the time of abortion.

incidence, as might be expected, was among spontaneous abortion. The highest incidence was found in self-induced abortion, and the next highest among abortions induced by midwives.

Hemorrhage appears to have been a much more frequent complication than infection. Here again, as might be expected, the self-induced abortions showed the highest incidence. The only case of therapeutic abortion complicated by hemorrhage was one interrupted in the fifth month because of placenta praevia. The high incidence of hemorrhage in spontaneous abortion (22 per cent) may be partly due to the exclusion of doubtful pregnancies which may have been uncomplicated early spontaneous abortions. It was assumed that unless there was unusual bleeding, diagnosis by a physician, or dilatation and curettage, there had been no pregnancy, since there was no other adequate evidence on which to base a diagnosis of pregnancy.

The significance of these figures from the standpoint of public health cannot easily be determined. On the surface it appears that illegal abortion performed by a physician is not a very serious danger to life and health, and that therapeutic abortion performed under proper conditions is as little dangerous as an operative procedure can be. It must be emphasized, however, that, just as the study of maternal mortality following abortion is a pessimistic approach to the question, so the study of a selected, fertile group of survivors is a sanguine one. Until we know the actual incidence of abortion in a community, morbidity and mortality statistics have little meaning; and until we know the incidence of serious complications and subsequent sterility or death in a given group in which the number of abortions is known, our answer must be equally incomplete.

In this particular group of women, the incidence of illegal abortion before attendance at a birth control clinic was high and had increased during the past twenty-five years. However, abortion was seldom the sole means of curtailing the size of their families.

On the contrary it appears to have been, in the main, the last resort of women who wanted no more children, who had tried by the best means they knew to prevent further conceptions, and failed.

SUMMARY

This study deals with a selected group of women who lived in the Borough of the Bronx and were patients of a birth control clinic in New York City. The material presented relates exclusively to the experience of the patients prior to their first visit to the clinic. No claim is made that the experience of this group of women is typical of that of any other population. Indeed, it is altogether likely that a similar study of women differently selected would yield different results. The findings are as follows:

1. Seventy per cent of pregnancies terminated in live births, 20 per cent in illegal abortions, and the remaining 10 per cent in spontaneous abortions, therapeutic abortions, ectopic pregnancies, and stillbirths.

2. Catholic women had a higher percentage of live births and a lower percentage of illegal abortions than did the other religious groups, but there were more illegal abortions per woman among Catholics than among Jews.

3. The per cent of pregnancies illegally aborted increased as marriage lengthened, though because of increased use of contraceptives the actual number of abortions was not higher in the later than in the earlier periods of married life.

4. The proportion of pregnancies terminated by illegal abortions increased rapidly during the past twenty-five years.

5. The per cent of pregnancies terminating in stillbirth, spontaneous abortion, and therapeutic abortion was not significantly different in the different religious groups, nor did it change with increasing length of marriage. There was also no significant change in the proportion of pregnancies thus terminated within the twenty-five year period studied.

6. About 75 per cent of the illegal abortions were induced by persons designated by the patients as doctors; only 6 per cent were self-induced, and the remainder were induced by midwives. The proportion of abortions induced by midwives was much higher among Catholics and Protestants than among Jews.

7. The incidence of complications in all types of abortion except those induced by the patient herself was relatively low. Therapeutic abortions were free from complication, considering the fact that the patients undergoing abortion were poor surgical risks. The study deals with the records of living fertile women and for this reason can contain no data concerning complications leading to sterility or death.

EPIDEMIOLOGY OF WHOOPING COUGH IN A RURAL AREA¹

by RALPH E. WHEELER, M.D., D.P.H.

DURING the last five years, there has been an annual average of 5,500 deaths from whooping cough in the United States Registration Area. It ranks among the outstanding causes of mortality among children in the first two years of life. Nor is death the only unfortunate result of the disease, for each one of the million and a half cases of whooping cough occurring every year in this country entails care and anxiety in the home and a long period of disability for the child. It is thus evident that this disease, although usually regarded as one of the minor afflictions of childhood, offers in reality a serious problem.

Whooping cough is commonly classed among the preventable diseases, but no practical preventive procedures have as yet been devised to check its epidemic prevalence. Much laboratory and epidemiological research must still be done to clarify and add to our knowledge of its modes of spread in communities. There has been a growing appreciation of the need of this type of study, and a number of epidemiological analyses of whooping cough have appeared within recent years, but it must be noted that they are for the most part based upon admittedly incomplete notification of cases in cities. Sydenstricker and Hedrick² have shown for

¹ From the Milbank Memorial Fund.

Acknowledgments are made to the Office of Statistical Investigations of the United States Public Health Service and the Milbank Memorial Fund for the data collected by the field assistants of these two organizations, namely, Miss F. Ruth Phillips, Miss Mae P. Duffy, Mrs. Blanche Hull, Miss Ruth L. Lewis, and Mrs. Alcesta Owen. The author's thanks are also due to Dr. Mary Gover, assistant statistician of the Public Health Service, who completed a considerable portion of the tabulations, and to Selwyn D. Collins, senior statistician of the Public Health Service, for advice, as well as to Edgar Sydenstricker and Miss Dorothy G. Wiehl of the Milbank Memorial Fund's staff.

² Sydenstricker, Edgar and Hedrick, A. W.: Hagerstown Morbidity Studies, Supplement to Study No. II. Completeness of Reporting of Measles, Whooping Cough and Chicken Pox at Different Ages. *Public Health Reports*, June 28, 1929, 44, No. 26, pp. 1537-1543.

Hagerstown (where physicians contributed practically all of the official case reports) that only half of the cases in 1922-1923 were attended by physicians and that only 16.8 per cent of all the cases were reported. In the rural area which was surveyed in the present study, a similar situation appears. The proportion of recorded whooping cough cases seen by a physician was 44.7 per cent, and only 15.8 per cent of the cases so seen were reported.

In order, therefore, to have reasonably accurate data for the study of whooping cough epidemiology, it is necessary to resort to special methods of collecting case data. Special canvasses and repeated house-to-house surveys over periods of time, supplemented where possible by medical diagnoses, constitute a method first employed in the Hagerstown studies, and these yield fairly accurate information for the broader aspects of the epidemiological study of disease. The present paper is based upon data obtained by this means in a rural population.³ The data here presented form a part of a morbidity study conducted by the research staffs of the United States Public Health Service and of the Milbank Memorial Fund in a rural section of Cattaraugus County in the western part of New York State. The area selected was made up of five townships totaling 224 square miles, and a population, at the 1930 Federal Census, of 5,500 persons. Of this number, 1,413 lived in three small villages, the largest with only 970 inhabitants. The remainder were distributed about the region on dairy farms or in small crossroad hamlets.

I. METHODS OF STUDY

This morbidity survey, as has been said, was conducted according to the general method employed in the similar study of

³ A more intensive method of study which included clinical observation of all cases and suspected cases as well as detailed records of all contacts, was used in the investigation of three small local outbreaks. A report has been published upon one of these studies. See: Burroughs, Travis P., M.D.: An Epidemiological Study of a Rural Outbreak of Whooping Cough. Milbank Memorial Fund *Quarterly Bulletin*, January, 1932, x, No. 1, pp. 41-52.

Hagerstown, Maryland,⁴ the chief difference being that, whereas only a sample of the Hagerstown population was kept under observation, an effort was made in the present survey to visit every household in the area. While there were many special aspects of the work, the technique of the communicable disease inquiry only is of present concern.

Beginning on September 1, 1929, households were visited and complete rosters obtained, with the birth date and communicable disease history of each living member and the date as well as cause of death of family members who had died. Any communicable disease occurring in the home after August 1, 1929, was also recorded on a special form with date of onset, source, duration, and treatment. The morbidity record, therefore, started on August 1st. When all households had been visited, revisiting began and records were kept of changes in the household rosters and of illnesses occurring in the intervals between visits. When individuals or families left the area, the date was noted and new families or individuals entering were added to the group under observation. Visits were spaced at regular intervals of four months when the roads permitted automobile travel, and individuals and families remaining in the area for the entire period were visited usually eight or nine times in the course of the thirty-two months. The staff continued to visit for other purposes after the termination of the study and kept a record of communicable disease that was complete for thirty-six months, or until August 1, 1932.

Special calendars left in the homes made possible a more complete and accurate record of illnesses, but it was found that there was a tendency to forget some of the milder conditions unless these had occurred just before the visit. On the whole, however, this factor did not enter into the recording of the more acute conditions, such as whooping cough. The informant was usually

⁴ Sydenstricker, Edgar: A Study of Illness in a General Population Group. *Public Health Reports*, September 24, 1926, 41, No. 39, p. 2069.

the housewife, and the family statement was accepted as final unless a physician had seen the case, in which event an attempt, usually successful, was made to obtain his diagnosis. Of course, where there was no medical attendance it was necessary to take the family's statement. While such a statement might be unreliable for the accurate identification of many ailments, it is felt that the diagnosis is sufficiently exact in overt cases of whooping cough. Thus practically none of the cases had so short a duration as to suggest that it may have been croup mistakenly diagnosed as whooping cough.

The chief problem presented by this type of recording in the case of pertussis would seem to be the extent to which the milder cases or *formes frustes* without the characteristic whoop were included. As an accurate diagnosis of these cases rests largely upon cough-plate studies, which could hardly have been incorporated in studies of this type, this question cannot be satisfactorily answered. However, the very high family secondary attack rate recorded among children under fifteen with no previous history of whooping cough suggests that, up to this age at least, these rural cases tend to be overt.

In calculating rates of incidence, the person-years of observation have been employed, rather than the census, for the reason that the population of the area varied to some extent, although not greatly, during the period of the survey. The rates so obtained become mean annual rates for the period. The high rates in epidemic years are thus averaged against the low ones in non-epidemic intervals, and what is obtained is a figure which represents the average annual expectation of morbidity from whooping cough in the population studied, provided the interval time is long enough.

In the following pages it is proposed to present: first, general observations on whooping cough morbidity; second, information obtained from remembered histories of former attack; and,

finally, some observations on the mode of spread of whooping cough in this fairly typical rural area.

II. MORBIDITY IN SURVEYED AREA AS A WHOLE

During the three-year period of the survey, a total of 280 cases of whooping cough were recorded by the method just described. In this group of cases no deaths were observed as a result either of the disease or of its complications. It is, therefore, necessary to confine the present discussion primarily to morbidity. However, the subject of mortality cannot be dismissed without observing that the high figures for whooping cough mortality in the early years of life are more the result of the great prevalence of the disease than of a high risk of death in persons who acquire it. The absence of deaths in this group of cases suggests that the case-fatality rate is, perhaps, lower than the figure of 0.66-0.80 per cent obtained by Wood⁵ in rural Pennsylvania.

In this connection it is of interest to note that there were also no deaths observed in the 374 cases of whooping cough recorded in the Hagerstown survey and that only three deaths were recorded in the total of 830 cases of this disease in the survey of the Committee on the Costs of Medical Care.⁶ The figure of 0.36 per cent for the case fatality derived from this latter survey is, of course, unsatisfactory because small chance variations in the number of deaths would affect it markedly, but it is in quite close agreement with the case-fatality rate of 0.33 per cent computed by Sydenstricker and Collins⁷ from histories of attack and histories of deaths due to whooping cough in the Cattaraugus survey population.

It will be readily appreciated that a disease with so high a gen-

⁵ Wood, H. B.: *Journal of Preventive Medicine*, March, 1932, vi, p. 87. The figure of one death to each 125 or 150 cases of whooping cough was obtained by counting only those deaths previously reported as cases.

⁶ Personal communication from Selwyn D. Collins. The Costs of Medical Care survey included urban as well as rural populations.

⁷ Sydenstricker, Edgar and Collins, S. D.: Age Incidence of Communicable Diseases in a Rural Population. *Public Health Reports*, January 16, 1931, 46, No. 3, p. 100.

eral mortality and so low a case fatality must be exceedingly prevalent.

1. *Mean Annual Incidence in Survey Area.* The total number of person-years of observation for the entire survey period was 14,821 and this, with the total of 280 cases, gave a mean annual rate of 18.9 per 1,000 person-years for the area and period. All but 20 of the cases occurred in individuals less than 20 years of age and for this younger age group, the mean annual rate was 46 per 1,000. It will later be shown that the proportion of persons at age 20 with remembered history of manifest whooping cough attack was about 80 per cent. This figure offers another method of calculating, very approximately, a mean annual rate for the past 20 years for persons under 20 years of age and thus of comparing the incidence observed during the survey with that in years prior thereto. Obviously if 80 per cent have the disease by age 20, the incidence was 4 per cent per year or 40 per 1,000. The method is only approximate because it implies accuracy of remembered history and stability of residence, but it is considered precise enough to indicate that the observed incidence of 46 per 1,000 was only slightly above the normal for the area.

The subject of mean annual rates is dwelt upon at some length because whooping cough, being an epidemic disease, has an exceedingly variable incidence during the shorter intervals of time, and may vary within such wide limits that annual rates, in a relatively small area such as the one at present under consideration, would have very little comparative value. Thus the annual rates for all ages for the three years of the survey were successively, 34.0, 3.8, and 19.7 per 1,000.

2. *Chronology of Cases by Months.* In Table 1, the cases are shown by month and year of onset. It will be seen that outbreaks of the disease occurred very nearly independently of season. Although few cases were recorded as starting in the late winter months of February and March, or in the late summer months

of August and September, it is quite possible that a longer period of study would have shown quite another seasonal distribution.

A more detailed account of the exact location of these outbreaks will be given below; for the present it suffices to note that they were confined to four main periods of prevalence. The first began, essentially, with the beginning of the survey and ended in February, 1930; the second began in April, 1930, and ended in August, 1930; the third began in October, 1930, and ended in January, 1931; and the fourth began in September, 1931, and ended, essentially, at the close of the survey.

Table 1. Whooping cough cases by month and year of onset, Cattaraugus County morbidity survey, 1929-1932.

First Year	Second Year	Third Year
1929	1930	1931
August 10	August 2	August —
September 6	September —	September 1
October 12	October 1	October 1
November 18	November 6	November —
December 22	December 8	December 5
1930	1931	1932
January 6	January 2	January 10
February 5	February —	February 3
March —	March —	March 9
April 13	April —	April 33
May 28	May —	May 19
June 23	June —	June 16
July 18	July —	July 3
TOTAL 161	TOTAL 39	TOTAL 100

3. *Geographic Distribution Within the Survey Area.* The 280 cases occurred in 121 households, variously distributed in four of the five townships comprising the surveyed area. The location of the farm households is shown in Figure 1, and the total number of attacked village homes is given separately. The map also shows roads and highways as well as the location of farm homes and hamlets which were not attacked.

It is evident that some large areas escaped a visitation of whooping cough entirely during the three years, and that other sections were but lightly attacked. When general rates are given for the area and period as a whole, therefore, they are to be construed as measuring incidence in a population rather than as measuring the risk of infection where exposure was universal.

Another outstanding fact is that relatively few homes were

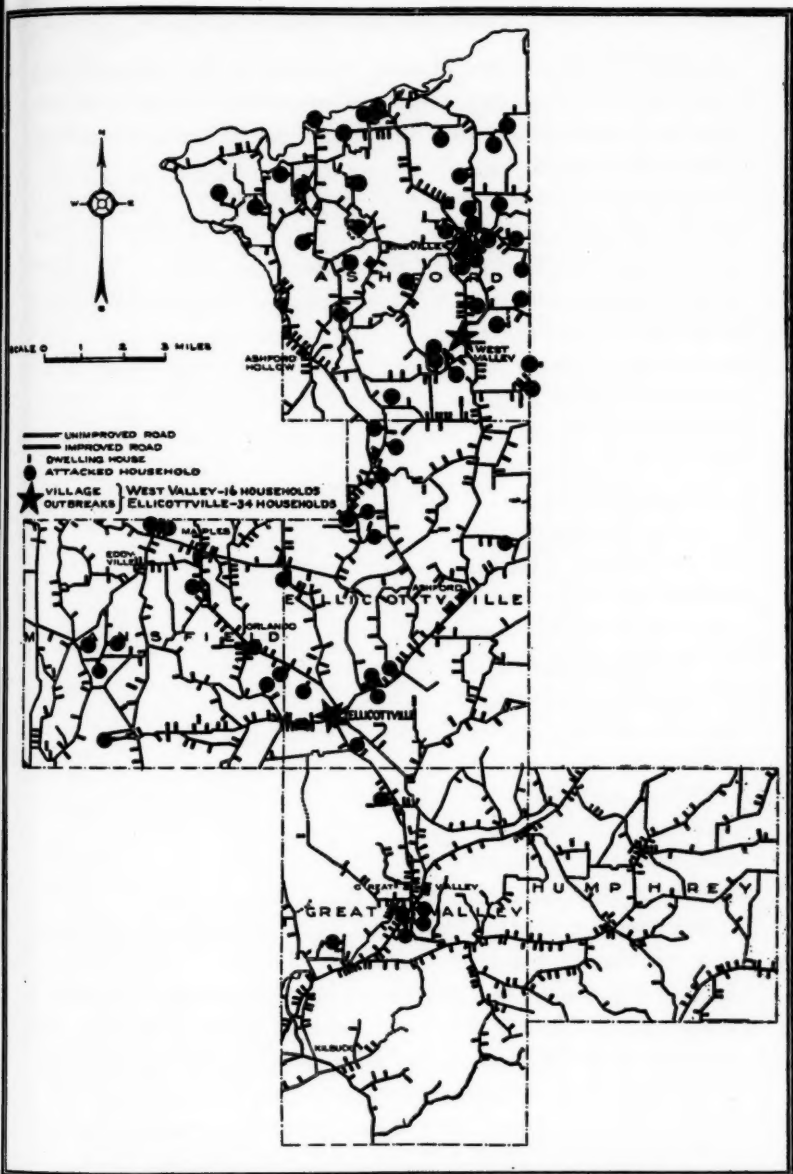


Fig. 1. Morbidity survey area, Cattaraugus County, showing highways, unimproved roads, and farm households. The households attacked by whooping cough for the entire period of the survey and the location of village outbreaks are indicated for the entire period of the survey, 1929-1932.

invaded by the disease. Thus in Ashford, which suffered two epidemics of whooping cough and was therefore the most severely attacked section, only 19 per cent of 295 farm and village homes were attacked, although fully 45 per cent of the homes contained one or more children or young adults with no remembered history of whooping cough.* In the whole area only 10 per cent of the homes were attacked during the course of the survey.

4. *Age Incidence.* The person-years of observation for the entire survey area and period, the cases of whooping cough and the rates per 1,000 person-years are shown by age in Table 2.

Before discussing the age-specific rates, however, it will be of interest to note certain characteristics of the age distribution of the population and of the cases. The population of the area is a typically rural one in that it shows a relatively high proportion of children under the age of 15 years when compared with the population of the State as a whole. When the percentage dis-

Table 2. Whooping cough case rates at specified ages in a surveyed population, Cattaraugus County morbidity area, 1929-1932.

Age	Rate per 1,000 Person-Years	Cases	Person-Years
ALL AGES	18.9	280	14,821 ¹
0	73.1	19	260
1	76.1	22	289
2	57.4	16	279
3	81.4	24	295
4	66.5	21	316
0-4	70.9	102	1,439
5	73.4	24	327
6	46.3	15	324
7	93.5	30	321
8	77.9	24	308
9	34.7	11	317
5-9	65.1	104	1,597
10	41.4	13	314
11	41.1	12	292
12	10.8	3	278
13	20.7	6	290
14	31.5	9	286
10-14	29.4	43	1,460
15-19	9.3	11	1,178
20-24	—	—	984
25-44	4.8	17	3,551
45+	0.6	3	4,569

¹ Includes 43 person-years for which age was unknown.

* The reliability of a negative history of whooping cough as an index of susceptibility in this population will be discussed below.

tribution by age is compared with that of cities, the preponderance of children is much more marked. In spite of the presence of more young children in the population, however, the age distribution of cases shows exactly the opposite tendency. Thus only 102, or 36.4 per cent of these cases are less than five years of age whereas in cities a very significantly greater proportion is usually found in this age group. The mean age for this whole series is 9.25 years, but this figure is perhaps unduly influenced by two cases aged 70 and 74 respectively so that the median of 6.92 years for the series perhaps defines more accurately the center of variation. This tendency of whooping cough, as indeed of most of the other acute infectious diseases of childhood, to

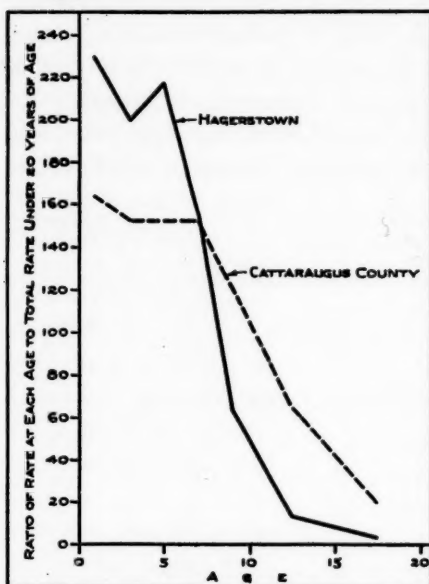
Table 3. Relative age incidence of whooping cough in a surveyed population in Cattaraugus County, 1929-1932, contrasted with a surveyed population in Hagerstown, Maryland, 1921-1923.

AGE GROUPS	RATIO OF RATE FOR EACH AGE TO RATE FOR ALL AGES ¹	RATE PER 1,000 PERSON-YEARS	NUMBER OF CASES	PERSON-YEARS
SURVEYED POPULATION, CATTARAUGUS COUNTY				
ALL AGES		45.8	260	5,674
0-1	163	74.7	41	549
2-3	152	69.7	40	574
4-5	152	70.0	45	643
6-7	152	69.8	45	645
8-9	122	56.0	35	625
10-14	64	29.4	43	1,460
15-19	20	9.3	11	1,178
SURVEYED POPULATION, HAGERSTOWN, MARYLAND				
ALL AGES		52.3	365	6,984
0-1	229	119.6	89	744
2-3	200	104.4	69	661
4-5	217	113.7	98	862
6-7	156	81.5	70	859
8-9	63	33.1	25	756
10-14	13	7.0	12	1,713
15-19	3	1.4	2	1,389

¹ Total rate for all ages under 20 years = 100.

occur at later ages in country than in city populations has been often noted and is mentioned here simply to add to the meagre data at present available for rural populations.

Fig. 2. Relative age incidence of whooping cough in a surveyed population in Cattaraugus County, 1929-1932, contrasted with a surveyed population in Hagerstown, Maryland, 1921-1923.



The age-specific rates in Table 2 reveal a relatively lower figure for ages under five years and a less rapid fall thereafter than do city rates. This point can best be illustrated by the comparison with similar figures obtained from Hagerstown, shown in Table 3 and Figure 2. As the prevalence in Hagerstown was considerably greater than in Cattaraugus, owing to the fact that whooping cough occurred throughout the surveyed population in the former, the rates here have been reduced

to a comparable basis by taking the ratio of the rate at a given age to the rate for all ages under 20 years.

It can be shown that this same tendency toward an older age distribution of cases in the smaller aggregates of population is found to hold within the surveyed area itself. This appears in the comparison of age-specific rates for village and for farm populations of the Cattaraugus survey in Table 4 and Figure 3. Here again differences in prevalence in the two groups have been

AGE GROUPS	RATIO OF RATE FOR EACH AGE TO RATE FOR ALL AGES ¹	RATE PER 1,000 PERSON-YEARS	NUMBER OF CASES	PERSON-YEARS
VILLAGE				
ALL AGES		66.1	93	1,407
0-4	168	111.4	42	377
5-9	170	112.6	42	373
10-14	34	22.5	8	355
15-19	5	3.3	1	302
FARM				
ALL AGES		39.1	167	4,267
0-4	144	56.5	60	1,062
5-9	129	50.6	62	1,224
10-14	81	31.7	35	1,105
15-19	29	11.4	10	876

¹ Total rate for all ages under 20 years = 100.

Table 4. Relative age incidence of whooping cough in a surveyed village population compared with the incidence in the surveyed farm population, Catauga County, 1929-1932.

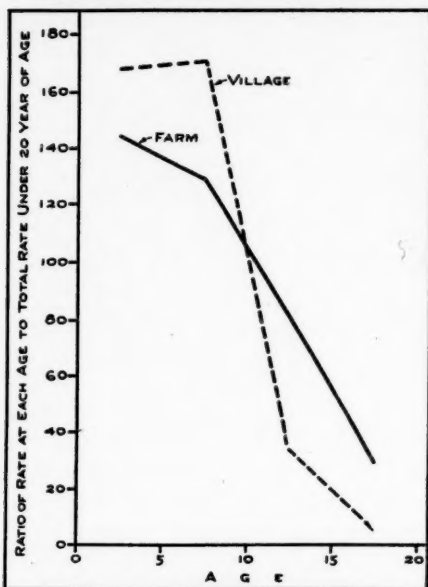
controlled by portraying the ratios of age-specific rates to the rate under 20 years of age.

One general feature of the survey which should be noted here is the attack rate in individuals with no previous history of whooping cough. These rates, by specified ages, are shown in Table 5. Individuals with no history of whooping cough, for the sake of brevity, are called "susceptible," the quotation marks indicating that this term may be subject to some criticism if taken too literally, for reasons to be detailed below. These rates are, again, average annual rates for the area as a whole and do not necessarily indicate the actual risk of infection in any one year. The incidence among "susceptibles" rises rapidly in the first five years of life and maintains a fairly high general level until the fifteenth year, when it drops abruptly.

5. *Sex Incidence in Whooping Cough.* The official mortality registration data of many countries show a somewhat higher whooping cough mortality for females than for males at most

of the ages of life. This excess mortality in females has long been recognized as a peculiarity of the disease and was at first considered to be due to anatomical differences between the two

Fig. 3. Relative age incidence of whooping cough in the surveyed village population compared with the incidence in the surveyed farm population, Cattaraugus County, 1929-1932.



sexes. Of late, however, the tendency has been to find an explanation, at least in part, on the basis of a higher incidence of the disease in females.⁹ To such an explanation the figures based upon reported cases give a certain amount of support, but it is possible that a disease which causes death more frequently in one sex may be more frequently attended by physicians when it occurs in that sex and therefore more frequently reported.¹⁰

It is of some interest to note that morbidity surveys show a definitely different sex incidence from the notification data. The first of these, the Hagerstown study,¹¹ reveals a prevalence that is actually somewhat greater among males at ages under 15 years. These results

⁹ A careful discussion of this question of case incidence and mortality in the two sexes will be found in a paper by A. Bradford Hill, entitled, *Some Aspects of the Mortality from Whooping Cough*, in the *Journal of the Royal Statistical Society*, 1933, xcvi, Part II, p. 250 ff.

¹⁰ In Cattaraugus 48 of the 123 males with whooping cough were medically attended and 66 of 130 females—percentages of 39 and 51 respectively. A total of 27 individuals were unknown as to medical attendance.

¹¹ Sydenstricker, Edgar: *Sex Differences in the Incidence of Certain Diseases at Different Ages*. *Public Health Reports*, May 25, 1928, xliii, No. 21, p. 1259.

are confirmed, so far as the children attending school in Hagers-town are concerned, by a separate study of school illnesses which was carried on there over a four-year period.¹²

The sex incidence at various ages for the rural Cattaraugus survey is shown in Table 6. It will be noted that there is a uniformly higher female rate at ages under 44 years but the differences are not significant in this rather small series of cases.

There is another source of information on this subject in the data on remembered history of attack. Manifestly, if females are more frequently attacked by the disease than males, there should be a greater proportion of the former with history of attack unless the excess female mortality is very high, which is known not to be the case. In Table 7 are shown the proportions at ages up to 25 years of males and of females with history of attack at the beginning of

Table 5. Whooping cough case rates at specified ages for a "susceptible" surveyed population, 1929-1932.

Age	Cases per 1,000 "Susceptible" Person-Years	Cases	"Susceptible" Person-Years
ALL AGES	69.6	261 ¹	3,752 ²
0	74.8	19	254
1	83.3	22	264
2	72.1	16	222
3	111.1	24	216
4	103.4	21	203
0-4	88.0	102	1,159
5	120.0	24	200
6	81.5	15	184
7	181.2	29	160
8	167.9	22	131
9	81.1	9	111
5-9	126.0	99	786
10	104.8	11	105
11	150.0	12	80
12	45.4	3	66
13	74.6	5	67
14	142.8	9	63
10-14	105.0	40	381
15-24	25.4	10	394
25-44	19.9	10	503
45+	—	—	529

¹ For the cases: 13 with stated previous history and 6 with unknown previous history excluded.

² For the population only the person-year period of those with known negative history of whooping cough has been included and that of individuals contracting the disease during the survey until the period of the attack.

¹² Collins, Selwyn D.: The Health of the School Child. Bulletin No. 200, U. S. Treasury Department, Public Health Service, August, 1931. See Table 11, p. 24.

AGE	MALE			FEMALE		
	Rate per 1,000	Cases	Person-Years	Rate per 1,000	Cases	Person-Years
ALL AGES	17.6	136	7,727	20.4	144	7,051
0-4	64.2	48	748	78.1	54	691
5-9	64.6	53	820	65.6	51	777
10-14	28.1	22	782	31.0	21	678
15-24	4.3	5	1,174	6.1	6	988
25-44	3.3	6	1,816	6.3	11	1,735
45+	0.8	2	2,387	0.5	1	2,182

Table 6. Incidence of whooping cough among males and females at specified ages for the entire surveyed population, 1929-1932.

AGE	MALES			FEMALES		
	Per Cent with Positive History	Number with Positive History	Number with Known History	Per Cent with Positive History	Number with Positive History	Number with Known History
ALL AGES	54.0	593	1,098	55.2	533	965
0-4	16.3	39	239	17.0	38	224
5-9	42.3	115	272	44.7	105	235
10-14	72.1	173	240	70.8	148	209
15-19	75.5	157	208	82.7	129	156
20-24	78.4	109	139	80.1	113	141

Table 7. Per cent of persons of each sex in the surveyed population who gave a history of an attack of whooping cough prior to the beginning of the survey, August, 1929.

the survey. It is evident that a difference of somewhat the same kind and degree appears here as in the sex-specific morbidity rates.

The present data suggest therefore that in a larger sample there might be a slightly but significantly higher incidence among females in rural Cattaraugus but whether this is due to an actual difference in incidence or whether it indicates that fewer males show manifest attacks is an open question. The differences, for our purposes, would appear to be of a low enough order so that they may be disregarded in the present study.

(To be continued)

ANNOTATIONS

THE MATERNITY AND CHILD WELFARE MOVEMENT¹

ALTHOUGH Dr. McCleary refers occasionally to the development of measures intended to safeguard the health of mothers and young children which have taken place in other countries, and which have been mutually stimulating, his main thesis is to trace the progress which has been made in these fields in England and Wales.

This study will be especially helpful to those in England who are interested in present-day activities on behalf of mothers and children, but because of the close relationship between the United States and Great Britain in the expansion of public health in general, including maternity and child hygiene, this book will be gratefully received by students and workers on this side of the Atlantic.

The author discusses his subject under the following headings: The Origins of the Maternity and Child Welfare Movement; Progress of the Movement During the War; Health Visiting; The Maternity and Child Welfare Centre; The Provision of Antenatal Care; The Unmarried Mother and Her Child; The Protection of the Unwanted Baby; The Preschool Child; How the State Recognition of Midwives Was Secured; The Working of the Midwives Acts; Maternal Mortality and Morbidity; The New Attack on Infant Mortality; The Administration of Maternity and Child Welfare Services; The Outlook.

Interest of the public on behalf of the child was perhaps first aroused from a realization that many little children were being exploited in industry, and that others were frequently being abused in unsupervised foster homes. This concern was reflected in the United States by the formation in 1876 of the Society for the Prevention of Cruelty to Children. Organized efforts to reduce the deaths of infants took form as the culmination of a long series of studies and protests by physicians

¹ McCleary, G.F., M.D.: THE MATERNITY AND CHILD WELFARE MOVEMENT. London, P. S. King and Son, Ltd., 1935.

and health officers, indicating that the number of infant deaths particularly from diarrheal diseases was excessive and largely preventable. The writer shows that the salvage of infant life through the Consultation de Nourrissons instituted by Budin, and the Gouttes de Lait by Variot and Dufour in France, made a profound impression in other countries, and led to the establishment of similar activities in England and elsewhere. These services demonstrated clearly that periodic medical supervision of the infant and proper diet would save many lives even amid unfavorable home surroundings.

The interest in reducing the deaths of infants was further aroused in England by the first National Congress on Infant Mortality in 1906, following which additional maternity and child welfare centers were established. In this same year, the United States Bureau of the Census published a report calling attention to the appalling loss of infant life in this country. The movement in England was greatly stimulated by the Notification of Births Act of 1907—extended in 1915—which made it possible for the proper authorities to learn within thirty-six hours of the birth of a baby, and to make prompt arrangements for its supervision. The World War tended to increase rather than diminish activities on behalf of mothers and children in England; the importance of child life was more than ever realized. It is to be noted in this connection that it was just after the war that the examination of millions of children during Children's Year (1918-1919), was carried on in this country under the auspices of the United States Federal Children's Bureau.

From this time health centers tended to increase in England, both in numbers and in facilities. Many became elaborately organized, furnishing various specialized services in addition to those of the doctor and health visitor. The passage in 1918 of the Maternity and Child Welfare Act in England was an important milestone in the progress of the movement. This Act permitted the National Government to assist local authorities in carrying on approved maternal and child health activities up to fifty per cent of their own expenditure, a procedure that was paralleled some years later in the United States in the passage of the Sheppard-Towner Act. Dr. McCleary feels that the success of maternal and child health activities in England has depended in large part upon the services of trained women, known as health visitors. These differ somewhat from the public health nurses who

have contributed so largely to the success of the movement on this side of the Atlantic. The first health visitors began as volunteers in 1862. For some time definite courses of training have been required, and the number of workers has increased until there are now about six thousand of these trained health visitors who are identified with official and volunteer organizations. The qualifications and courses of training are outlined.

It was, of course, long known that much of the infant mortality of the first month results from conditions present before the birth of the child. That many of these conditions could be diagnosed and successfully treated was forcefully and repeatedly demonstrated early in the century by the distinguished Scotch obstetrician, Dr. J. W. Ballantyne. His interest in the mother and newly-born child resulted in bringing to many mothers antenatal care through home visits, rest homes or hospitals, and through special prenatal clinics, the first of which were established in Edinburgh in 1915, and likewise in London, the same year. This phase of the movement grew slowly, but at present over forty per cent of women delivered in England attend prenatal clinics.

The extent of illegitimacy, its effect upon the infant mortality rate, the ways by which indifference and prejudice have been gradually overcome, and the legal rights of the young unmarried mother secured and the unwanted baby cared for in properly supervised institutions or foster homes, are described in the chapters on these subjects.

Experience in England, as outlined in the section on the preschool child, confirms that in this country that a reduction in infant mortality is accompanied by an even greater decrease in the death rate of older children up to five years. This has apparently been brought about by methods effective in saving the lives of infants. Our own experience has shown, however, that the problem of the older children is one not of mortality alone, but of preventable morbidity, and of the frequency of remediable physical defects. The school service in England and in this country is too often the receiver of damaged goods.

Various methods of supervising the health of toddlers are discussed, such as the day nursery, the nursery school, the nursery class, a part of the school system for children over three years, playgrounds, and attendance at child consultations. All of these activities have their counterparts in this country. The difficulty of securing needed corrective treatment apparently is present in both countries.

The steps which led to the enactment of the Midwifery Act in England, and the operation of the Act, are described in detail. Midwifery is probably the oldest known profession. For centuries, what we speak of today as midwifery, as distinguished from obstetrical practice, was engaged in often by untrained, ignorant women. The author shows that it was only after many years of controversy among the profession, lay workers, and in Parliament, that the Midwifery Act was passed in England in 1902. The Act provides for certification by a Central Midwifery Board with authority to set up standards of training and supervision. The required course has been extended from three to twelve months, and can be given in a number of different centers.

Although much progress is shown to have been made in establishing the midwife as a member of a recognized profession, her fees are small, and her work has not been coordinated satisfactorily with the maternity and child health movement. However, the experience in England should prove valuable in many of our own states, where little has yet been done to provide training for the midwife, upon whom many rural women depend.

In the chapter devoted to maternal mortality and morbidity, the author points out that notwithstanding all that has been done in England for the protection of motherhood, the death rate from diseases incident to pregnancy is higher than it was twenty years ago. This is true also in the United States, and it may be explained by a probable higher incidence of abortions; by a lower birth rate with the greater proportion of first births associated with higher risks, and by more accurate accounting.

The author quotes the report made to the Ministry of Health by a special committee on maternal mortality and morbidity, to the effect that fully one-half of all maternal deaths are preventable, that they do not occur in well-conducted clinics, and are due in general to four avoidable causes:

1. Omission or inadequacy of antenatal care.
2. Error of judgment in management of cases.
3. Lack of reasonable facilities.
4. Ignorance of the patient or her friends.

Those who are familiar with the situation are painfully aware that similar conditions prevail in many parts of the United States. The

need for more general antenatal care, for additional hospital beds for abnormal cases, for improved training of students and midwives, which are recommended, have been constantly urged by teachers of obstetrics in the United States. The British Committee proposes the development of existing agencies into a "National Maternity Service," in which hospital services, specialists, general practitioners, midwives, and health officers are all to be associated as interdependent units. One would like to see such a Utopian maternity program in operation in every state in the Union.

In the section on infant mortality, the author refers to the well-known fact that the reduction in infant death rates in recent years in England (from 156 in 1900 to 64 in 1933), has been due to a marked decrease in the deaths from diarrheal diseases, and to a less degree to those from respiratory diseases. The methods proved effective in preventing enteritis and pneumonia will not greatly reduce the deaths in the first few days and weeks of life. These can be curtailed only by antenatal and natal care of the mother, which will also tend to diminish abortions and stillbirths. Protecting the unborn child so that it may be born well and at term through proper supervision of the mother is described as the "new attack on infant mortality."

The author describes briefly the administration of maternity and child welfare services in England and Wales under the Ministry of Health. Local health activities are carried on through administrative counties and county boroughs, each with a council and a staff of physicians, health visitors and other workers. Volunteer bodies often cooperate with the official staff and may take over a special form of activity. This plan of local public health services has furnished the model upon which the whole-time health units in our own country have been based.

As our author looks toward the future, he considers the setting up of a national maternity service a most pressing need, as a means not only of reducing morbidity and mortality among childbearing women, but of diminishing stillbirths and neonatal deaths. He also urges more continuous supervision of the preschool child from infancy to the school period.

Dr. McCleary has traced for his readers the rise and growth of measures which have promoted the health of mothers and children in England and Wales. It seems at times that he has introduced an un-

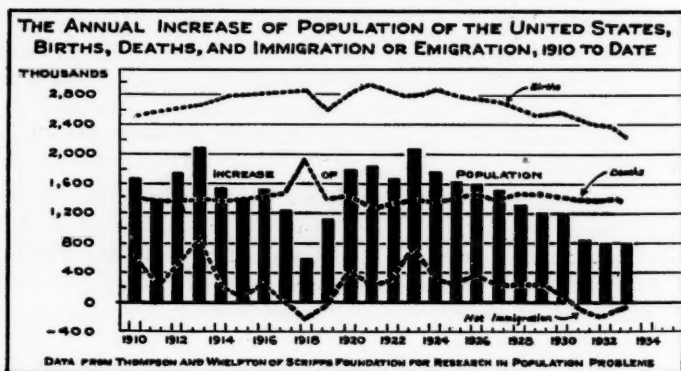
necessary multiplicity of dates and details confusing to one not familiar with English social and political practice, and there is also an apparent lack of logical sequence in his chapters. The book does, however, enable one interested in present-day services of maternity and child hygiene to understand more clearly the various origins of the movement, and the many factors contributing to this development. With this knowledge, the reader should have increased confidence that the maternity and child welfare movement will continue to expand in England, and let us hope also in this country, until adequate provision is made for every mother and young child.

J. H. MASON KNOX, M.D.

THE OUTLOOK FOR POPULATION¹

A CONCISE and graphic summary of the slowing up of our population growth is afforded by a chapter, "The Outlook for Population," cooperatively prepared by O. E. Baker and Nettie P. Bradshaw,

Fig. 1. Ten years ago the population of the United States was increasing about 1,800,000 a year. Now the increase is only 800,000. A stationary population is approaching rapidly. The number of births has been trending downward since 1921. There are now fully 11 per cent fewer children under 5 years of age than when the census was taken nearly 5 years ago, and 9 per cent fewer 5 to 10 years of age. The number of deaths remains almost stationary, but must increase soon because of the rapid increase of old people.



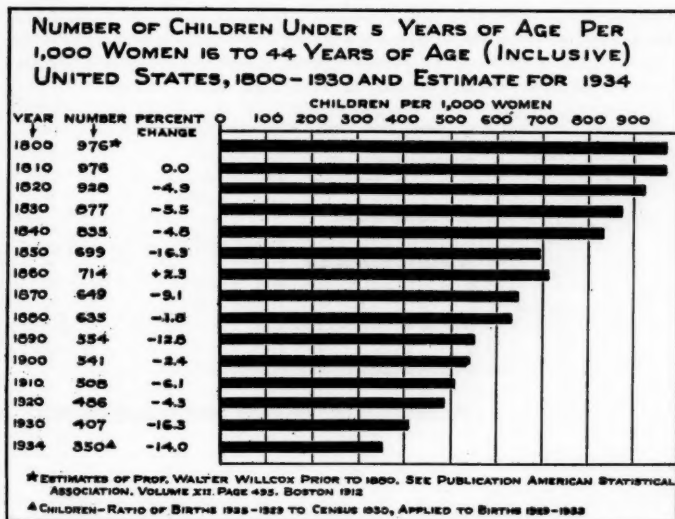
¹ A chapter included in the Report of the Land Planning Committee (Part II of the general reports of the National Resources Board), Washington, Government Printing Office, 1934, pp. 92-97.

United States Department of Agriculture, and Warren S. Thompson and J. B. Dennison of the Scripps Foundation for Research in Population Problems. The chapter was included in the Report of the Land Planning Committee of the National Resources Board for its intimate bearing on policies of land utilization, discussed in other sections of the general report.

Several charts together with the authors' comments are sufficient to tell the story of what is taking place in our population growth. While the growth of population in this country has probably been without precedent in the history of the world, the rates of increase are now diminishing and a stationary, or perhaps a declining population, is approaching. This condition is due partly to our immigration restrictions and partly to the decline of the birth rate.

The annual increase of population, as shown by the bars in Figure 1,

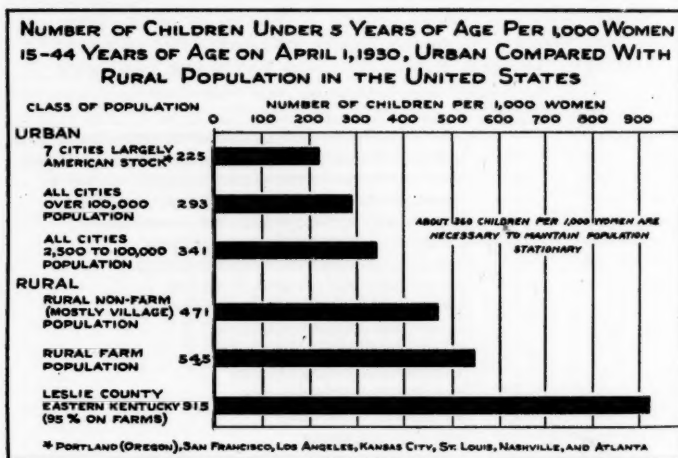
Fig. 2. The birth rate, as measured by the ratio of children under 5 to women of child-bearing age, has been decreasing in the United States for more than a century. From 1920 to 1930, the decline was over twice as rapid as in previous decades, except those ending in 1850, 1870, and 1890, when it is evident there was an abnormal under-enumeration of young children. From 1930 to 1934, the decline was almost as great as in any previous decade. The significant fact shown by the graph is that the declining birth rate is a long-time trend, and that the rate of decline has become more rapid in recent years.



was over 2,000,000 in 1923 and only 800,000 in 1933. From the lower line of the chart it will be seen that in 1923 the net immigration (excess of arrivals in the United States over departures) was almost 800,000. From the time of the quota laws (in effect after July 1, 1924) until 1929, the net immigration was approximately 250,000 per year. Since 1931, due to the depression and consequent administrative restrictions, the outward movement has actually exceeded the inward movement.

While the decline in the birth rate has been of long duration, the rate of decline in recent years has been very conspicuous (*see* Figure 2). In fact, from 1921 to 1933² there was a marked decline in the actual annual number of births (*see* Figure 1). This decline averaged about

Fig. 3. About 360 children under 5 years of age per 1,000 women 15 to 45 years of age (childbearing age) are required to maintain population stationary at the 1930 expectation of life in the United States of 62 years. In 1930, the seven cities largely of American stock, represented in the top bar of the graph, lacked, therefore, about 38 per cent of having enough children to maintain their population permanently without accessions from outside, and all cities of over 100,000 population had a deficit of nearly 20 per cent, while the smaller cities had a deficit of about 6 per cent. On the other hand, the rural non-farm (mostly village and suburban) population had a surplus of 30 per cent, and the farm population a surplus of 50 per cent. In 1932, urban deficit and rural surplus about balanced.



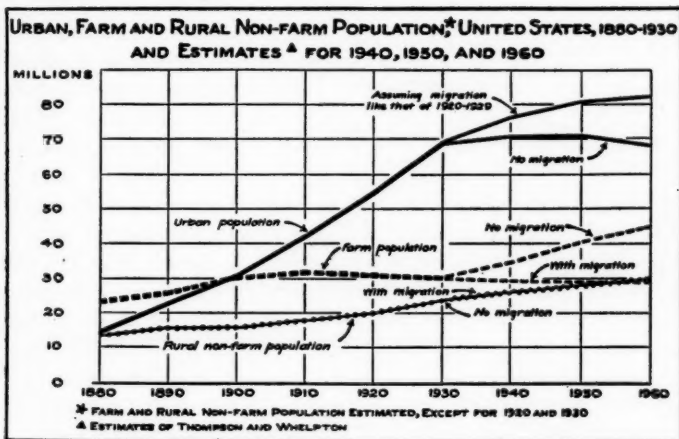
² Since the report was published, official figures have indicated a slight rise in the 1934 birth rate, due perhaps to marriages which had been postponed during the earlier years of the depression.

50,000 per year in 1922-1929 and 100,000 per year in 1930-1933.

Factors such as social status, rural-urban residence, migration, and age-composition, have important bearing on the birth rate and on the future size and characteristics of our population. Studies of the Milbank Memorial Fund are cited to indicate that "families of business men average 5 to 10 per cent more children than those of professional men, skilled laborers a quarter to a third more than business men, and unskilled laborers about a fourth more than skilled laborers."

It is clearly indicated in Figure 3 that urban centers are not reproducing their numbers but must depend upon the rural regions for replenishment. The extent of rural-urban migration will probably exert much influence on the natural increase in the United States

Fig 4. During the half century, 1880-1930, urban population in the United States increased more than fourfold, rural non-farm population (estimated prior to 1920) nearly doubled, and rural farm population increased scarcely a half. Practically all of this increase in farm population took place before 1910, little change in number occurring between 1910 and 1930. Looking to the future, and using Dr. Thompson's assumptions as to births and deaths, with no net immigration from foreign lands, it appears that the urban population, under the assumption of no internal migration, will increase less than 3 per cent by 1945 and then decline slowly; rural non-farm population will increase gradually until after 1960, by which year it will be about one-fourth larger than in 1930, while rural farm population will increase by about a half. But assuming the continuation of the 1920-1929 migration, urban population will continue to increase until after 1960, by which year it will be nearly 20 per cent larger than in 1930, rural non-farm population will increase about the same as if no migration occurred, while farm population will slowly but constantly decline.



because urban residence will serve as a deterrent to birth rates of the migrants. Therefore, in presenting estimates of the future growth of

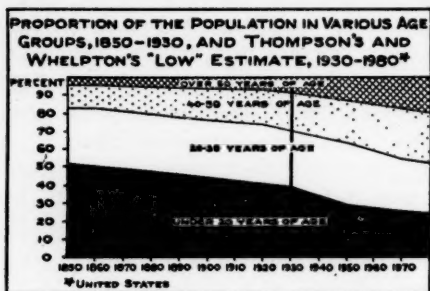


Fig. 5. In 1870, over half the population was under 20 years of age, but in 1930 less than 40 per cent. By 1950, these children and young people probably will constitute only 30 per cent of the population and by 1980 or before, only 25 per cent. In 1870, about 5 per cent of the population was over 60 years of age. By 1930, the proportion had risen to 8.6 per cent. By 1950, these old people will constitute 13 per cent of the population, and by 1980 probably 20 per cent. In 1870, about 45 per cent of the population was between 20 and 60 years of age, which may be considered the productive years of life, taking the people as a whole. By 1930, people in these productive ages constituted 52.6 per cent of the total population. By 1950, they will constitute about 57 per cent, and by 1980 perhaps 55 per cent. During the next few decades, when population will be almost stationary, a larger proportion of the population will be of productive age than in the past, or, probably, in the more distant future.

population. Even those who do not share in the grave concern manifested by some students will agree that fundamental changes must accompany such trends of population. In the past, commercial planning and much of the population thinking have been geared to the prospect of rapidly increasing population. However, students who view the present trends with interest but not with despair probably base their stand on the belief that readjustments can be made gradually and that the "good life" of the individual need not be curtailed in a stationary population.

urban, farm, and rural non-farm population, two widely different assumptions of the extent of migration are made (*see* Figure 4). The true growth will probably lie between the extremes presented.

An important corollary of the declining birth rate and cessation of immigration is the aging of our population shown in Figure 5. The decrease in the proportion of young people will have its repercussions in birth rates of the future, while the increasing proportion of older people presents economic and social problems for social engineers of tomorrow.

Students of population differ in their attitudes concerning the implications of an approaching stationary or declining

CLYDE V. KISER

THE EFFICACY OF THE SCHOOL MEDICAL EXAMINATION

THE school medical examination has become so routine a health procedure in the public school system that any challenge of its efficacy almost smacks of heresy. Yet recently its efficacy is being questioned more and more frequently. A few references to the chorus of doubts may be pertinent:

Franzen, in his studies of school health procedures, arrived at the conclusion that "thorough examinations by the physician are very desirable but very rare."¹

Downes, reporting upon a study of defects and diseases as discovered through medical examinations and as revealed by sickness experience in a group of children in the Olean, New York, schools, pointed out:

If the fairly common assumption were true, that a medical examination, as a method of revealing hidden defects and impairments, is an adequate means of appraising the health of the individual, one should expect a fairly consistent and high correlation between the existence of defects or impairments and the incidence of actual sickness during a period of 2 years in a group of school children. This was not found to be the case in the experience recorded.²

In England, doubts are being expressed as to the value of school medical inspection as conducted there. Cronk,³ in a recent article, asserts that the existing routine, in which every child is examined thrice in its school life, is wasteful of the physician's time, is superficial, and is unnecessary for most children.

Kerr, in his review of Cronk's paper, comments that the paper "observes in practice conditions of failure predicted at the outset of the school system, when the pursuit of school hygiene was abandoned for medical inspection 'on the broad basis of public health.'"⁴

The attitude of the healthy skeptic as regards this public health pro-

¹ Franzen, Raymond: An Evaluation of School Health Procedures. American Child Health Association School Health Research Monograph No. V., p. 72.

² Downes, Jean: Sickness Records in School Hygiene. *American Journal of Public Health*, November, 1930, p. 1204.

³ Cronk, H. L.: School Medical Inspection. *Public Health*, 1930, 48, pp. 253-7.

⁴ Kerr, James: *Bulletin of Hygiene* (London) July, 1935, pp. 422-423.

cedure is expressed by Burke, writing from Canada in a recent article. He said:

It seems to me that on this continent the guiding minds in school medical inspection are, after twenty years, still trying, by the mere finding of physical defects in school children, to justify their work and its subsequent cost to the public in both the up-keep of the machinery and the direct cost to the families in correcting the defects so found. I think the time is overdue for taking the machine apart to see how it is constituted, to determine carefully its efficiency, and, above all, to see whether it is headed in the right direction.⁵

The cost of medical inspection or examination is so gigantic that the procedure calls for scientific appraisal of its value. Probably there will be few who would demand its abolition. Some of the more important aspects of the question which need clarification and evaluation are: (1) improvement in quality of the medical examination itself; (2) the determination of when and where it can be used to real advantage; and (3) its proper place in a program of school hygiene and its coordination with health services to preschool children as well as to school children, including health education and the training of teachers in hygiene and public health.

EDGAR SYDENSTRICKER

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METHODS AND MATERIALS OF HEALTH EDUCATION

IT is difficult in the rapidly growing field of school health education to keep pace with modern trends. Teachers left with the responsibility of developing effective programs often find a conflict between methods by which they, in their own school days, were "taught health" and the present-day philosophy that health education is the "sum of all experiences which favorably influence habits, attitudes, and knowledge relating to individual, community, and racial health." They are confused with the vast amount of health educational material that comes in their direction and often lack bases for properly evaluating it in terms of the well-rounded growth and development of the whole child.

⁵ Burke, F. S.: The Preschool Child and School Medical Inspection. *Canadian Public Health Journal*, April, 1933, p. 170.

A recently published book, *METHODS AND MATERIALS OF HEALTH EDUCATION*,¹ by Dr. Jesse Feiring Williams and Miss Fannie B. Shaw, does much to clarify for both teachers in training and in service the present trends in school health education. Drawing freely from many sources, the authors summarize the channels through which, and the methods by which, health education may function effectively in a school.

The early sections of the book include chapters on the most recent definitions and terms employed in health education and an analysis of the nature of the child. Of special interest from the standpoint of public health is the summary of the economics of illness.

The main sections of the book "deal with the three aspects of health education, namely healthful school living, health service, and health instruction." Particularly helpful are chapters on "Rôle of Official and Non-official Organizations in Health Education," "Materials for Teaching Health," and "The Health of the Teacher."

If health is to "flow from the kind of living that goes on" then all experiences with health significance in the child's day must be recognized and utilized by the teacher in her educational program. In the chapter dealing with healthful school living accepted standards for school buildings are presented briefly and well. Classroom experiences influencing health behavior and conditions of the school organization essential for health are also included. A very excellent and much needed discussion is given of the basic causes of disciplinary problems, school failures, and fatigue. One should read with care what is said about such problems as the hygiene of writing and drawing and the importance of planning the day's program to avoid overfatigue. It is regrettable, however, that in this section there is no mention of the ways in which the children themselves may take part in studying the problems of healthful school living and in planning improvements in the school environment and its use. One must wait for such suggestions in the chapters on "Health Instruction" and, more particularly, on "Materials for Teaching Health."

An outstanding contribution of the book is its inclusion of numerous criteria for selecting and evaluating health education procedures and materials. Authoritative sources are quoted on such points as essential

¹ Williams, Jesse F. and Shaw, Fannie B.: *METHODS AND MATERIALS OF HEALTH EDUCATION*. New York, Thomas Nelson and Sons, 1935.

qualifications and duties of health counselors, guiding principles for developing correlations, types of health education materials potentially dynamic, and guides for selecting health textbooks and for using such other teaching aids as the radio, posters, charts, graphs, and the like.

Although the book is intended primarily as a textbook for teacher-training institutions it should be a helpful reference book for principals, teachers in service, nurses, and others interested in school health education.

RUTH E. GROUT

ERRATUM for article entitled, "The Age Incidence of Tuberculosis and Its Significance for the Administrator," by Jean Downes and reprinted from the *Milbank Memorial Fund Quarterly*, Vol. xiii, No. 2, April, 1935.

Please change the vertical scale for Figure 2 to read 5, 10, 15, and 20 per 10,000 instead of 10, 20, 30, and 40 per 10,000.

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